

AD-A156 279

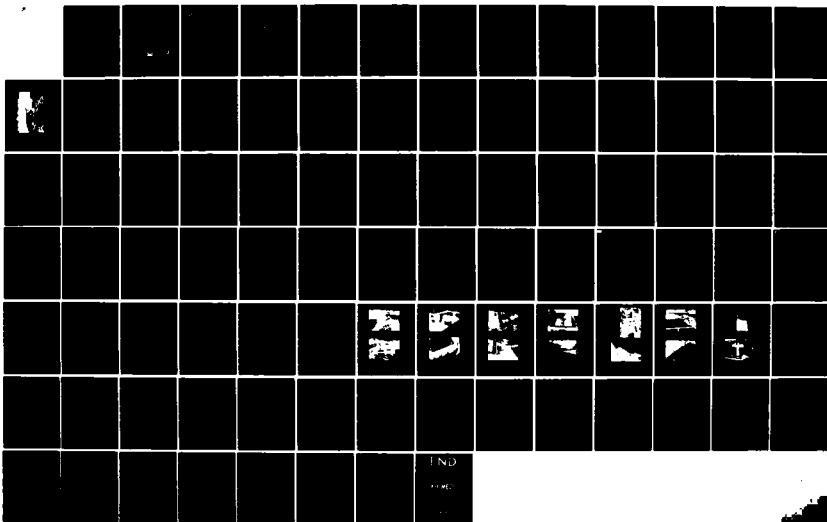
NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
GOOSE POND DAM (NH 00... (U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV MAY 79

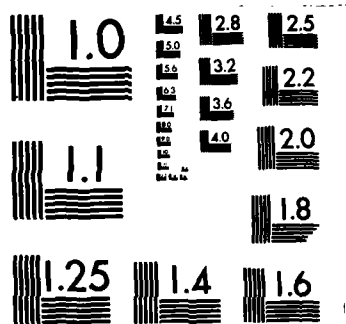
1/1

UNCLASSIFIED

F/G 13/13

NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

AD-A156 279

CONNECTICUT RIVER BASIN
CANAAN, NEW HAMPSHIRE

GOOSE POND DAM
NH 00118

NHWRB 36.01

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



DTIC
ELECTE
JUL 08 1985
S G D

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

MAY 1979

DISTRIBUTION STATEMENT A
Approved for public release;
Distribution Unlimited

85 06 13 097



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF:
NEDED

JUN 29 1979

Honorable Hugh J. Gallen
Governor of the State of New Hampshire
State House
Concord, New Hampshire 03301

Dear Governor Gallen:

I am forwarding to you a copy of the Goose Pond Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

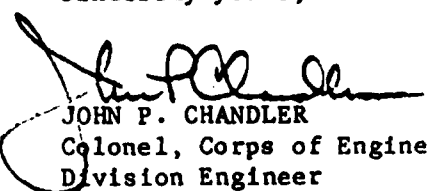
A copy of this report has been forwarded to the Water Resources Board, the cooperating agency for the State of New Hampshire. In addition, a copy of the report has also been furnished the owner, the State of New Hampshire, New Hampshire Water Resources Board, Concord, New Hampshire 03301, ATTN: Mr. George M. McGee, Sr., Chairman.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Water Resources Board for your cooperation in carrying out this program.

Sincerely yours,

Incl
As stated


JOHN P. CHANDLER
Colonel, Corps of Engineers
Division Engineer

DISCLAIMER NOTICE

**THIS DOCUMENT IS BEST QUALITY
PRACTICABLE. THE COPY FURNISHED
TO DTIC CONTAINED A SIGNIFICANT
NUMBER OF PAGES WHICH DO NOT
REPRODUCE LEGIBLY.**

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER NH 00118	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Goode Pond Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS		8. CONTRACT OR GRANT NUMBER(s)
11. CONTROLLING OFFICE NAME AND ADDRESS DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		12. REPORT DATE May 1979
		13. NUMBER OF PAGES 67
		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) APPROVAL FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) DAMS, INSPECTION, DAM SAFETY, Connecticut River Basin Canaan, New Hampshire Goose pond Dam		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The dam is a 1240 ft. long earthfill dam. The maximum height of the dam is 31 ft. The dam is judged to be in fair condition. It is intermediate in size with a high hazard potential classification. The slope on the upstream slope east of the spillway should be re-established. The exposed concrete surface of the core wall should be repaired.		

FORM 100-10

REPRODUCED AT GOVERNMENT EXPENSE

GOOSE POND DAM

NH 00118

NHWRB 36.01

CONNECTICUT RIVER BASIN
CANAAN, NEW HAMPSHIRE

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

REC
BY
DATE

Accession For	
NTIS GRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By _____	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A/	23 CN

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

Identification No.: NH 00118
Name of Dam: Goose Pond Dam
Town: Canaan
County & State: Grafton, New Hampshire
Stream: Goose Pond Dam
Date of Inspection: June 8, 1978

BRIEF ASSESSMENT

Goose Pond Dam is located in the central western part of the State of New Hampshire, approximately nine miles northeast of the City of Lebanon. It is a 1,240-foot long earth fill dam that was reconstructed in 1952, with an upstream concrete core wall and riprap on the upstream face. The maximum height of the dam is 31 feet. The concrete spillway is an Ambursen box type modified for flood discharge. It has an effective length of 50 feet and is topped with sectional flashboards.

Based on visual inspection, available records and past operational performance, the dam is judged to be in fair condition. Standing water was noted at the toe of the eastern and western embankments. Riprap on the upstream slope eastern of the spillway and for a length of 40 feet has been partially washed away. Erosion of the concrete core wall was also noted. Continuance of this classification depends on proper operations and maintenance of the dam.

This dam falls under the category of high hazard potential, and it is intermediate in size. The test flood peak inflow is equal to the probable maximum flood, 28,730 cfs, and the test flood peak outflow is 3,650 cfs obtained as a result of routing the test flood through the pond. Hydraulic analysis indicates that the maximum surcharge pool elevation will be 105.3 (local datum) approximately 7 feet below the top of the dam. The project will pass the test flood peak outflow without overtopping the dam, and therefore, the spillway capacity is adequate.

The following recommended operation and maintenance measures, as stated in Section 7.3, be implemented within 1 year of the receipt of this Phase I report by the owner:

1. The slope protection on the upstream slope east of the spillway should be re-established.
2. The exposed concrete surface of the core wall should be repaired.

3. The areas where standing water was observed should be monitored regularly to determine the cause and then corrective measures should be taken.
4. Vegetation should be removed except for grass cover that prevents slope erosion.
5. Upstream slope of the dam and the intake structure should be inspected at low water.
6. A program of regular maintenance should be established.
7. A program of technical annual periodic inspection of the project features should be prepared and initiated.
8. A plan for surveillance and a warning system should be developed for periods of unusually heavy rains and runoff.


FAY, SPOFFORD & THORNDIKE, INC.
By



Jurgis Gimbutas
Jurgis Gimbutas, P.E.
Project Engineer

Richard W. Albrecht
Richard W. Albrecht, P.E.
Vice President

This Phase I Inspection Report on Goose Pond Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.



CHARLES G. TIERSCH, Chairman
Chief, Foundation and Materials Branch
Engineering Division

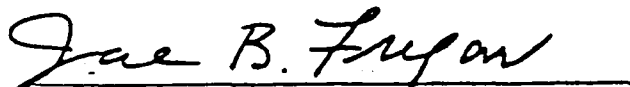


FRED J. RAVENS, Jr., Member
Chief, Design Branch
Engineering Division



SAUL COOPER, Member
Chief, Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:



JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonable possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition, and the downstream damage potential.

TABLE OF CONTENTS

	<u>Page</u>
Letter of Transmittal	
Brief Assessment	i
Review Board Signature Sheet	iii
Preface	iv
Table of Contents	v
Overview Photograph	viii
Location Map	ix
REPORT	
SECTION 1 - PROJECT INFORMATION	1
1.1 General	1
a. Authority	1
b. Purpose	1
1.2 Description of Project	1
a. Location	1
b. Description of Dam	2
c. Size Classification	2
d. Hazard Classification	2
e. Ownership	3
f. Operator	3
g. Purpose of Dam	3
h. Design and Construction History	3
i. Normal Operational Procedure	4
1.3 Pertinent Data	4
a. Drainage Area	4
b. Discharge at Dam Site	4
c. Elevation (Feet above local datum)	5
d. Reservoir	5
e. Storage (Acre-Feet)	5
f. Reservoir Surface (Acres)	6
g. Dam	6
h. Spillway	6
i. Regulating Outlets	7
SECTION 2 - ENGINEERING DATA	8
2.1 Design	8
2.2 Construction	8

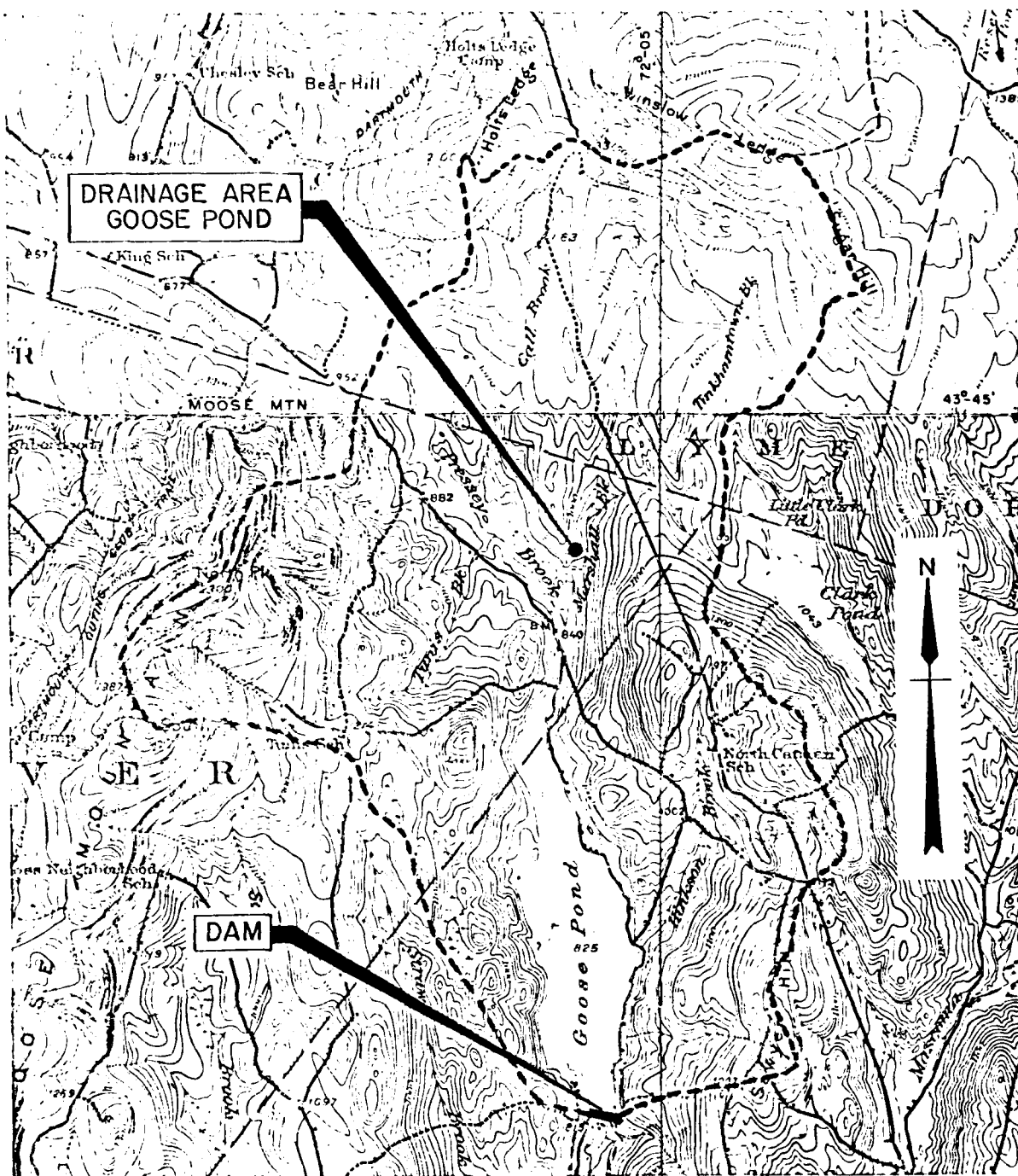
	<u>Page</u>
2.3 Operation	8
2.4 Evaluation	8
a. Availability	8
b. Adequacy	8
c. Validity	9
SECTION 3 - VISUAL INSPECTION	10
3.1 Findings	10
a. General	10
b. Dam	10
c. Appurtenant Structures	11
d. Reservoir Area	11
e. Downstream Channel	11
3.2 Evaluation	11
SECTION 4 - OPERATIONAL PROCEDURES	13
4.1 Procedures	13
4.2 Maintenance of Dam	13
4.3 Maintenance of Operating Facilities	13
4.4 Description of any Warning System in Effect	13
4.5 Evaluation	13
SECTION 5 - HYDRAULIC/HYDROLOGIC	14
5.1 Evaluation of Features	14
a. Design Data	14
b. Experience Data	14
c. Visual Observations	14
d. Overtopping Potential	14

	<u>Page</u>
SECTION 6 - STRUCTURAL STABILITY	16
6.1 Evaluation of Structural Stability	16
a. Visual Observations	16
b. Design and Construction Data	16
c. Operating Records	16
d. Post-Construction Changes	16
e. Seismic Stability	16
SECTION 7 - ASSESSMENT, RECOMMENDATIONS & REMEDIAL MEASURES	17
7.1 Dam Assessment	17
a. Condition	17
b. Adequacy of Information	17
c. Urgency	17
d. Need for Additional Investigation	17
7.2 Recommendations	17
7.3 Remedial Measures	17
7.4 Alternatives	18
APPENDIX A - VISUAL INSPECTION CHECK LISTS	A-1
APPENDIX B - EXISTING AVAILABLE INFORMATION	B-1
APPENDIX C - PHOTOGRAPHS	C-1
APPENDIX D - HYDROLOGIC & HYDRAULIC COMPUTATIONS	D-1
APPENDIX E - INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS	E-1

OVERVIEW PHOTOGRAPH



GOOSE POND DAM, LOOKING WEST
Negative No. 8-1A



SCALE : 1:62500 (ACTUAL)

UNITED STATES
DEPARTMENT OF INTERIOR
GEOLOGICAL SURVEY

NEW HAMPSHIRE-VERMONT
MASCOMA QUADRANGLE 1927
MT. CUBE QUADRANGLE 1931

GOOSE POND DAM

SECTION 1 - PROJECT INFORMATION

1.1 General

a. Authority

Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Fay, Spofford & Thorndike, Inc., Engineers, have been retained by the New England Division to inspect and report on selected dams in the State of New Hampshire. Authorization and notice to proceed was issued to Fay, Spofford & Thorndike, Inc., under a letter of May 3, 1978, from Mr. Ralph T. Garver, Colonel, Corps of Engineers. Contract No. DACW 33-78-C-0308 has been assigned by the Corps of Engineers for this work.

b. Purpose

- (1) Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.
- (2) Encourage and prepare the states to initiate quickly effective dam safety programs for non-Federal dams.
- (3) To update, verify, and complete the National Inventory of Dams.

1.2 Description of Project

a. Location

Goose Pond is located in the central western part of the state of New Hampshire. The dam is located on the southern tip of the pond, within the Town of Canaan, and nine miles northeast of Lebanon. The outlet, Goose Pond Brook, is a tributary to the Mascoma and Connecticut Rivers. There is a road and about twenty houses located along the eastern shores of Goose Pond and several houses are located near the dam on the downstream side. The nearest town is Enfield,

which is about 7 miles downstream and along the courses of Goose Pond Brook and Mascoma River.

b. Description of Dam

This is a rolled earth dam with a concrete core wall. The overall dimensions are 1,240 feet in length, 31 feet in height, and 12 feet wide at the top. The earth embankment has an upstream slope of 1 vertical to 2 1/2 horizontal, covered with riprap (Photographs No. 1 and 11, Appendix C) and a downstream slope of 1 vertical to 2 horizontal. There are four clean-out basins along the downstream toe near the east end of the dam (Photograph No. 13, Appendix C).

The concrete spillway is of rectangular Ambursen type, 15 feet wide, with flashboards on three sides, for a total effective length of 50 feet (Photographs No. 2 and 3, Appendix C). At the bottom of the intake structure, there is a rectangular concrete culvert, 10 feet wide by 10 feet high with stop logs at the upstream end (Photograph No. 4, Appendix C). There are two 4-foot by 4-foot gates with the sill 29.5 feet below the top of the dam. The gates discharge into the same culvert. The manually-operated gate shafts are supported on a platform over the spillway. This platform has concrete piers, steel beams, and a creosoted planking floor (Photograph No. 14, Appendix C).

The discharge sluiceway on top of the culvert is 11 feet wide and is located near the center of the dam. It is wider on the downstream side and has concrete wingwalls. The culvert, projecting approximately 50 feet downstream, serves as an apron for the spillway overflow (Photographs No. 6, 7, and 8, Appendix C). There is a foot-bridge across the sluiceway, connecting both halves of the embankment.

c. Size Classification

The storage capacity at the spillway crest is 11,688 acre-feet, which falls in the range $\geq 1,000$ and $< 50,000$ acre-feet. On the basis of Table 1, Size Classification, in the "Recommended Guidelines for Safety Inspection of Dams," furnished by the Corps of Engineers, the dam is classified as intermediate in size.

d. Hazard Classification

In the event of failure of this dam, the town of Enfield, which is at a distance of approximately 7 miles downstream of the dam, will be in danger of being flooded. The depth of the water at the damage impact area, as shown on page 14 in Appendix D, is estimated. It is also estimated that in the event of failure of this dam, loss of more than a few lives and excessive property damage would probably

occur. Therefore, on the basis of Table 2, Hazard Potential Classification, in the "Recommended Guidelines for Safety Inspection of Dams," furnished by the Corps of Engineers, this dam falls in the category of high hazard potential.

e. Ownership

During construction of this dam between 1917 and 1918, the owner was the Mascoma River Improvement Company of Lebanon, New Hampshire. In 1936, the same owner was referred to as a subsidiary of the New England Power Service Company.

In 1938, the owner was the Granite State Electric Co. of Lebanon, New Hampshire, which was also affiliated with the New England Power Service Company. Since 1969, Goose Pond Dam, the water rights and land connected therewith were acquired by the New Hampshire Water Resources Board. Therefore, the present owner is the State of New Hampshire.

f. Operator

The dam is being operated by the New Hampshire Water Resources Board, 37 Pleasant Street, Concord, New Hampshire, telephone (603) 271-3406. Mr. Vernon Knowlton is the chief engineer.

g. Purpose of Dam

Goose Pond Dam was built to store spring run-off waters in order to maintain normal flow needed for power plants on Mascoma River. While doing this, the dam helps to maintain the required water level for recreation. There are numerous cottages and houses on the lake shore.

h. Design and Construction History

The original dam was a rock filled timber crib dam built in the 19th century and approximately 10 feet high. It had a 59-foot long spillway and a trap gate at the base of the dam to drain the pond. It was impractical to repair this dam, and a new earth embankment with a concrete core wall was constructed between August, 1917, and July, 1918. The new dam was designed by Mascoma River Improvement Company, Engineering Department, Turners Falls, Massachusetts. The contractor was H. P. Cummings Construction Co., Canaan, New Hampshire. The new dam was constructed about 50 feet downstream from the old dam. The earth embankment required 19,000 cubic yards of material and the core wall 1,450 cubic yards of concrete. The new dam is approximately 12 feet higher than the existing one. A rectangular Ambursen

type reinforced concrete spillway with concrete cut-off walls, bulk-head walls, an apron, and a sluiceway constituted the intake/discharge structure. It is located near the center of the 1240-foot long dam.

During construction of the dam in the winter of 1917-1918, Mr. Arthur T. Safford, a consulting engineer of Lowell, Massachusetts, was consulted regarding the safety of the unfinished dam to pass the oncoming spring freshet.

The owner undertook major repairs and improvements of the dam in 1952. It was engineered by the New England Power Service Company, Boston, Massachusetts. The New Hampshire Water Resources Board approved the owner's petition for reconstruction on June 16, 1952. The work was done between October, and December, 1952. The spillway discharge was increased by reducing the elevation of the concrete crest by 5 feet and installing 5-foot flashboards. A stop log section was constructed, and the discharge conduit was covered to make a rectangular culvert. The top width of the earth dike was increased from 5 feet to 12 feet and was regraded. The concrete core wall was strengthened by widening the footings and adding concrete buttresses.

i. Normal Operational Procedure

This dam is checked weekly by personnel of the New Hampshire Water Resources Board using their established procedures. The only control available to lower the pond level is a 10-foot by 10-foot concrete conduit that is regulated by two gates and stop logs, both of which are manually operated.

1.3 Pertinent Data

All the elevations and information presented below are with respect to local datum. According to the U.S.G.S. Quadrangle Sheet, the top of the spillway flashboard, Elevation 106.5 (local datum), is equal to 825 msl (estimated).

a. Drainage Area

Goose Pond as shown on the U.S.G.S. Quadrangle Sheet is located on the headwaters of Goose Pond Brook. It has a total drainage area of 15.7 square miles and the watershed is highly wooded and mountainous.

b. Discharge at Dam Site

- (1) Outlet works (sluice culvert) - size 10 feet by 10 feet at Invert Elevation 83.0 (Photograph No. 4, Appendix C). The estimated discharge capacities of this culvert

are given below with both gates, each 4 feet by 4 feet,
fully open and stop logs closed:

608 cfs at Reservoir Elevation 101.5 (top of concrete
spillway)

704 cfs at Reservoir Elevation 106.5 (top of flash-
boards)

- (2) Maximum known flood at dam site - information not
available.
- (3) Ungated spillway capacity at top of dam - 6700 cfs at
Elevation 112.50.
- (4) Ungated spillway capacity at test flood maximum pool
elevation - 3650 cfs at Elevation 105.3 (see page 13 in
Appendix D).

c. Elevation (Feet above local datum)

- (1) Top of dam - 112.5.
- (2) Test flood maximum pool - 105.3.
- (3) Top of flashboards - 106.5.
- (4) Spillway crest (top of concrete) - 101.5.
- (5) Stream bed at centerline of dam - 81.5.
- (6) Maximum tailwater - 86.0 (estimated).

d. Reservoir

- (1) Length of maximum pool - 3.2 miles (estimated).
- (2) Length of recreation pool - 2.5 miles.
- (3) Length of flood control pool - not applicable.

e. Storage (Acre-Feet)

- (1) Top of dam - 15,800 acre-feet.
- (2) Test flood maximum pool elevation - 10,800 cfs.

- (3) Recreation pool - unknown.
- (4) Spillway crest - 8,487 acre-feet.

f. Reservoir Surface (Acres)

- (1) Top of dam - 740 acres (estimated).
- (2) Maximum pool - 650 acres (estimated).
- (3) Flood control pool - not applicable.
- (4) Recreation pool - unknown.
- (5) Spillway crest - 610 acres.

g. Dam

- (1) Type Earth fill embankment.
- (2) Length 1,240 feet.
- (3) Height 31 feet.
- (4) Top width 12 feet.
- (5) Side slopes
 - (a) Upstream Approximately 1 vertical to 2.5 horizontal.
 - (b) Downstream 1 vertical to 2 horizontal.
- (6) Zoning Not applicable.
- (7) Impervious core Not applicable.
- (8) Cutoff Upstream concrete core wall.

h. Spillway

- (1) Type Rectangular (Ambursen).
- (2) Length of weir Effective length 50 feet.

- (3) Crest elevation
(top of concrete)
 - (a) Front 104.5.
 - (b) Sides 101.5.
 - (4) Flashboard Pin-type flashboards - 5 feet and 2 feet high.
 - (a) Crest elevation
(top of board) 106.5.
 - (5) U/S Channel Pond.
- i. Regulating Outlets
- (1) Invert 88.5 upstream and 81.3 downstream.
 - (2) Size 10-foot by 10-foot submerged culvert with a 10-foot by 15-foot entrance opening.
 - (3) Description Rectangular concrete culvert.
 - (4) Control mechanism Stop logs and two 4-foot by 4-foot gates, manually operated.

SECTION 2 - ENGINEERING DATA

2.1 Design

Drawings indicating plans, elevations and sections of the dam and appurtenant structures, including the details of the discharge facilities, are available from project records. Selected drawings are included in Appendix B, following the listing of records, and past inspection reports. Soil Profiles, limited in nature, are also available from project records.

2.2 Construction

No engineering data are available on the construction of this dam.

2.3 Operation

No engineering operational data was disclosed. The original use of the storage in this pond was for generation of hydropower. Presently, the pond is used for recreation. Goose Pond is a part of the Mascoma River storage system. The operation of Goose Pond is inter-linked with the operation of the remaining three lakes of the Mascoma River system, namely, Grafton Pond, Crystal Lake, and Mascoma Lake. Goose Pond is the largest of four ponds in the terms of storage volume. The pond is filled by spring runoff, and the resulting stored water is gradually released during the summer to supplement dry weather flow in the Mascoma River and to maintain the level of Mascoma Lake. The fall rains result in additional water being stored for use during the winter months and to keep the channel open at the Lebanon Water Works Pumping Station. The pond level is dropped to a point consistent with the amount of snow cover to make room for spring runoff.

2.4 Evaluation

a. Availability

Pertinent structural, geotechnical, and hydrologic data, which formed the basis of the design of the dam, are available on a limited basis.

b. Adequacy

Sufficient engineering data are available for a Phase I inspection.

c. Validity

The available data is considered valid on the basis of the results of the visual inspection.

SECTION 3 - VISUAL INSPECTION

3.1 Findings

The Phase I inspection of the Goose Pond Dam was performed on June 8, 1978. A copy of the inspection check list is included in Appendix A.

a. General

In general, the soil features are in fair condition. The concrete was observed to be in poor to good condition, see subparagraph c.

b. Dam

No evidence of vertical or horizontal misalignments was observed. There is no indication of sloughing, bulging, or movement of the slopes nor is there any evidence of piping.

The riprap slope protection on the upstream slope is in poor to fair condition. A section of the slope protection, approximately between 66 feet and 105 feet east of the spillway, has been washed away.

Standing water, approximately 300 feet west of the spillway, was observed at the toe of the western embankment. The area appears inadequately graded for drainage, and it is probable that the water observed is a combination of runoff and seepage.

At the toe of the eastern embankment between the two extreme eastern clean-out basins, standing water was observed. The area downstream of the dam in this area is not adequately graded for drainage, and it is probable that this water is trapped runoff rather than seepage.

The four clean-out basins located east of the spillway are in good operating condition. Visual observations indicate approximately 2 to 4 inches of sand in the bottom of the basin.

Vegetation, consisting of grass and weeds, was noted on the upstream slopes and on the top of the dam. Small bushes were observed on the downstream slope.

c. Appurtenant Structures

At the time of our inspection, the water level of the pond was at elevation 106.6 (local datum), approximately 0.1 foot above the top of the spillway flashboard. Therefore, we could not visually inspect the intake structure, the outlet culvert (10 feet by 10 feet), the two 4-foot by 4-foot gates regulating flow into the outlet culvert due to the fact that they were underwater.

The concrete of the spillway and its wingwalls above the water level was observed to be in good condition. Joint alignment is generally good and no erosion was noted.

The manually operated gate shafts are supported on a platform over the spillway. The crosstred wooden planking floor of the platform and the footbridge is in very good condition. The flashboards and the manually operated gate shafts were observed to be in operable condition. The railings of the platform and the footbridge are in good condition.

The exposed concrete of the core wall is in poor condition. Both horizontal and vertical cracks were observed with numerous areas of erosion. The concrete of the outlet structure and its wingwalls above the water level was observed to be sound. Joint alignment is generally good and no erosion was noted.

d. Reservoir Area

Goose Pond covers 668 acres in the towns of Canaan and Hanover in Grafton County, New Hampshire. It was formed by a dam on the Goose Pond Brook, which is a tributary to the Mascoma River, and is located 8.6 miles above Mascoma Dam. The pond collects the runoff from a drainage area of 15.7 square miles. The pond is approximately 2.5 miles long. There are several private cottages and year-round residences located on the shores of the pond. The reservoir shores are heavily wooded.

e. Downstream Channel

The downstream channel and side slopes are in good condition.

3.2 Evaluation

The observed condition of the dam is fair. The potential problems observed during the visual inspection are listed as follows:

a. Standing water at the toe of the eastern and western embankments.

b. Erosion of the exposed concrete of the core wall.

c. Lack of slope protection on the upstream slope between 66 feet and 105 feet east of the spillway.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 Procedure

The New Hampshire Water Resources Board has operated Goose Pond Dam since 1969. The Pond level is maintained by a box type spillway located at the center of the dam. The flow is controlled by sectional flashboards 5 feet high and 2 feet high. The only control available to lower the pond level is a 10-foot by 10-foot conduit that is regulated by two gates and stop logs, both of which are manually operated.

4.2 Maintenance of Dam

The maintenance of Goose Pond Dam is the responsibility of the New Hampshire Water Resources Board.

4.3 Maintenance of Operating Facilities

Throughout the year, the Dam is visited on a weekly basis by an inspector from the New Hampshire Water Resources Board. The maintenance of the gate operating facilities controlling the flow through the undersluice at the bottom of the intake structure is satisfactory:

4.4 Description of any Warning System in Effect

A flood warning system is non-existent.

4.5 Evaluation

The operation and maintenance procedures for Goose Pond Dam, consisting of a weekly program of inspection, should ensure that all problems encountered can be remedied within a reasonable period of time.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design Data

- (1) This dam falls under the category of high hazard potential, and it is intermediate in size. Using the "Recommended Guidelines for Safety Inspection of Dams," the recommended spillway test flood peak inflow is equal to the probable maximum flood. The spillway test flood inflow hydrograph, estimated, is furnished in Appendix D. The test flood peak inflow is 28,730 cfs.
- (2) The estimated peak outflow is 3,650 cfs, corresponding to the routed spillway test flood through the pond. Refer to Appendix D for details.
- (3) The Goose Pond storage capacity versus the elevation, an estimated capacity curve, is included in Appendix D.
- (4) The estimated composite discharge rating curve for all the discharge facilities is furnished in Appendix D.
- (5) The hydrologic map of the watershed above the dam site, including the reservoir area, watercourse, and elevation contours, is furnished in Appendix D.

b. Experience Data

Except for limited information, past flood details are not available for this dam.

c. Visual Observations

The crest of the non-overflow section is 11 feet above the crest of the spillway. At the time of inspection, water was observed flowing over the flashboards on the spillway crest. The hydraulic design of the spillway is good.

d. Overtopping Potential

The spillway test flood peak inflow is 28,730 cfs. Using the spillway test flood inflow hydrograph, the composite rating curve for all the discharge facilities, the capacity curve, detailed flood routing computations were made, and it was found that the surcharge

elevation to be approximately 105.3 (see Appendix D for details). There is enough clearance since the top of the earth embankment is at Elevation 112.5. Therefore, the dam will not be overtopped by the test flood if all the discharge facilities are functioning at their optimum capacity.

SECTION 6 - STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

The upstream slope could not be seen due to the fact that it was under water. The visual inspection revealed the following evidence of possible stability problems:

- (1) Standing water at the toe of the eastern and western embankments.
- (2) Lack of slope protection on the upstream slope between 66 feet and 105 feet east of the spillway.

Visual inspection of the concrete core wall and spillway section did not reveal any evidence of instability.

b. Design and Construction Data

There are no design computations available, but design drawings, dated 1917 and 1952, were obtained from project records.

c. Operating Records

Except for memorandums and correspondence listed in Appendix B, other records are not available at the office of the New Hampshire Water Resources Board.

d. Post-Construction Changes

No changes were made since 1952.

e. Seismic Stability

The dam is located in Seismic Zone 2 and in accordance with recommended Phase I guidelines does not warrant seismic analyses.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS & REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition

Visual inspection and operational history indicates that Goose Pond Dam is in fair condition and functioning satisfactorily.

b. Adequacy of Information

An adequate assessment of the dam consistent with the scope of Phase I investigation has been made based upon the visual inspection and available information.

c. Urgency

The recommended operation and maintenance measures enumerated below should be implemented within 1 year of receipt of this Phase I report by the owner.

d. Need for Additional Investigation

The information available from the visual inspection is adequate to identify the potential problems which are: standing water at the toe of the western and eastern embankments, and the lack of slope protection on the upstream slope east of the spillway. These problems require the attention of the engineering staff of the New Hampshire Water Resources Board to determine the cause, and then specify remedial measures to rectify the problem. If left unattended, the problems could lead to instability of the structure.

7.2 Recommendations

No major modification or engineering investigation is recommended at this time.

7.3 Remedial Measures

It is considered important that the following operating and maintenance procedures be attended to as early as practical:

a. The slope protection on the upstream slope between 66 feet and 105 feet east of the spillway should be reestablished. If not corrected, this could develop into a serious problem.

b. The concrete surface of the core wall should be repaired as continued deterioration could develop into a serious problem.

c. Standing water was observed at the toe of the eastern and western embankments. These areas should be monitored regularly to determine the cause. If it is seepage from the pond, appropriate remedial measures should be taken.

d. Vegetation should be removed from the dam embankment, except for grass cover that prevents slope erosion.

e. Upstream slope of dam and the intake structure should be inspected at low water.

f. A program of regular maintenance should be established.

g. A program of technical annual periodic inspection of the project features should be prepared and initiated.

h. Because the dam is located upstream of a populated area, round-the-clock surveillance should be provided during periods of high precipitation.

i. The owner should develop a formal warning system. An operational procedure to follow in the event of an emergency should also be adopted.

7.4 Alternatives

None recommended.

APPENDIX A
VISUAL INSPECTION CHECK LISTS

APPENDIX A

VISUAL INSPECTION CHECK LIST PARTY ORGANIZATION

PROJECT Goose Pond Dam DATE June 8, 1978
 TIME 1330 - 1630
 WEATHER Cloudy - Drizzle
 W.S. ELEV. 106.5 U.S. DN.S.
106.5 (local datum) =
825 msl

PARTY:

1. <u>Jurgis Gimbutas, P.E.</u>	<u>Team Captain - Structural and Concrete</u>
2. <u>Harvey H. Stoller, P.E.</u>	<u>Soils, Geology, & Foundations</u>
3. <u>V. Rao Maddineni, P.E.</u>	<u>Hydraulics & Hydrology</u>

PROJECT FEATURE	INSPECTED BY	REMARKS
1. <u>Dam Embankment</u>	<u>H. H. Stoller</u>	<u>Fair</u>
2. <u>Outlet Works - Culvert</u>	<u>J. Gimbutas</u>	<u>Buried</u>
3. <u>Outlet Structure</u>	<u>J. Gimbutas</u>	<u>Good</u>
4. <u>Outlet Channel</u>	<u>H. H. Stoller</u>	<u>Good</u>
5. <u>Approach Channel</u>	<u>V. R. Maddineni</u>	<u>Good</u>
6. <u>Spillway Weir</u>	<u>J. Gimbutas</u>	<u>Good</u>
7. <u>Reservoir and Downstream Channel</u>	<u>V. R. Maddineni</u>	<u>Good</u>

PERIODIC INSPECTION CHECK LIST

PROJECT Goose Pond Dam DATE June 8, 1978

PROJECT FEATURE Dam Embankment

DISCIPLINE Soils & Foundations

NAME Henry H. Stiller

PROJECT FEATURE _____

DISCIPLINE _____

NAME _____

DISCIPLINE _____

NAME _____

AREA EVALUATED	CONDITION
----------------	-----------

DAM EMBANKMENT

Crest Elevation	112.5
Current Pool Elevation	106.6
Maximum Impoundment to Date	107.1
Surface Cracks	None observed
Pavement Condition	None
Movement or Settlement of Crest	None observed
Lateral Movement	None observed
Vertical Alignment	No visual vertical misalignment observed
Horizontal Alignment	No horizontal misalignment observed
Condition at Abutment and at Concrete Structures	Normal

PERIODIC INSPECTION CHECK LIST

PROJECT Goose Pond Dam DATE June 8, 1978

PROJECT FEATURE Dam Embankment

DISCIPLINE Soils & Foundations

NAME Henry H. Stiller

PROJECT FEATURE _____

DISCIPLINE _____

NAME _____

DISCIPLINE _____

NAME _____

AREA EVALUATED

CONDITION

Indications of Movement of
Structural Items on Slopes

None observed

Trespassing on Slopes

None observed

Sloughing or Erosion of
Slopes or Abutments

None observed

Rock Slope Protection -
Riprap Failures

Poor to fair condition

Unusual Movement or
Cracking at or Near Toes

None

Unusual Embankment or
Downstream Seepage

See narrative (Section 3)

Piping or Boils

None observed

Foundation Drainage
Features

None

Toe Drains

Good condition (clean-out
basin)

Instrumentation System

None

PERIODIC INSPECTION CHECK LIST

PROJECT Goose Pond Dam DATE June 8, 1978
PROJECT FEATURE Culvert
DISCIPLINE Structures & Concrete NAME Wm. J. [unclear]
PROJECT FEATURE _____
DISCIPLINE _____ NAME _____
DISCIPLINE _____ NAME _____

AREA EVALUATED

CONDITION

OUTLET WORKS -
10-FOOT BY 10-FOOT CULVERT

General Condition

Could not be seen

PERIODIC INSPECTION CHECK LIST

PROJECT Goose Pond Dam DATE June 8, 1978

PROJECT FEATURE Outlet Structure

DISCIPLINE Structures & Concrete

NAME Simon

PROJECT FEATURE Outlet Channel

DISCIPLINE Soils & Foundations

NAME Henry H. Still

DISCIPLINE Hydraulics & Hydrology

NAME W. P. Haddock

AREA EVALUATED

CONDITION

OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL

General Condition of Concrete	Good condition
Rust or Staining	None observed
Spalling	None observed
Erosion or Cavitation	None observed
Visible Reinforcing	None observed
Any Seepage or Efflorescence	None observed
Condition at Joints	Good
Drain Holes	None observed
Channel	
Loose Rock or Trees Overhanging Channel	None observed
Condition of Discharge Channel	Good

PERIODIC INSPECTION CHECK LIST

PROJECT Goose Pond Dam DATE June 8, 1978

PROJECT FEATURE Spillway Weir

DISCIPLINE Structures & Concrete

NAME Edmunds

PROJECT FEATURE Approach Channel

DISCIPLINE Soils & Foundations

NAME Harry H. Stiller

DISCIPLINE Hydraulics & Hydrology

NAME W. R. McEachern

AREA EVALUATED	CONDITION
----------------	-----------

OUTLET WORKS - SPILLWAY WEIR, APPROACH CHANNEL

a. Approach Channel

General Condition	Good
Loose Rock	
Overhanging Channel	None observed
Trees Overhanging Channel	None observed
Floor of Approach Channel	Could not be observed

b. Weir and Training Walls

General Condition of Concrete	Good
Stop logs and slots	Good condition
Rust or Staining	None observed
Spalling	None observed

PERIODIC INSPECTION CHECK LIST

PROJECT Goose Pond Dam DATE June 8, 1978
 PROJECT FEATURE Spillway Weir
 DISCIPLINE Structures & Concrete NAME J. G. M. B. C.
 PROJECT FEATURE _____
 DISCIPLINE _____ NAME _____
 DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
Any Visible Reinforcing	None observed
Any Seepage or Efflorescence	None observed

APPENDIX B
EXISTING AVAILABLE INFORMATION

APPENDIX B

1. Listing of Records and Their Location

The New Hampshire Water Resources Board, 37 Pleasant Street, Concord, New Hampshire, has four folders of records and correspondence from 1915 to 1977. These folders are filed under Town/Dam No. 36.01, Canaan/Goose Pond.

The documents of importance to the design and maintenance of the dam are as follows:

- (1) June, 1917 to July, 1918. Letters regarding the design and construction of an earth dam and concrete spillway in lieu of an old worn out timber crib. The correspondence regarding the sand and gravel test results was written by representatives of the Connecticut River Conservation Co., Turners Falls, Massachusetts; the Public Service Commission, Concord, New Hampshire; and Pittsburgh Testing Laboratory, Pittsburgh, Pennsylvania. This file includes five photographs that were taken during the construction.
- (2) February 4, 1918. A technical report by Mr. Arthur T. Safford, Consulting Engineer, Lowell, Massachusetts, regarding the safety and capacity of the unfinished dam to pass the oncoming spring flood.
- (3) May 6, 1952. A petition by the Granite State Electric Co. to the New Hampshire Water Resources Board for reconstruction and repairs of the dam. This petition was granted by order of the New Hampshire Water Resources Board on June 16, 1952. The letter was signed by Mr. L. R. Frost, Water Resources Engineer.
- (4) October, - November, 1952. Five large photographs taken during the reconstruction of the dam.
- (5) May 20, 1968. A description of properties in the towns of Canaan and Hanover proposed to be deeded to the State of New Hampshire, including Goose Pond.
- (6) 1969. An act by the general court authorizing the New Hampshire Water Resources Board to acquire the dam and water rights of Goose Pond.

- (7) March 15, 1974. Five photographs for the Corps of Engineers' inventory program. No copy of the inventory program was available.

The following files at the New Hampshire Water Resources Board contain important hydrological data and hydraulic computations:

- (1) 1915. The maximum flood discharges from 1895 to 1915, on the Connecticut River drainage area.
- (2) July 8, and 9, 1915. The flood discharge curves.
- (3) November 10, 1933. The watershed and storage capacities and a plan of operation of the Mascoma River storage system, including Goose Pond.
- (4) 1952-1953. Several sheets of hydraulic analyses by Mr. F. C. Moore, Civil Engineer.
- (5) 1953-1961. Discharge ratings tabulated by Mr. L. D. Pierce, New England Power Service Co.
- (6) 1962. Profiles at Goose Pond Dam.
- (7) September 18, 1967. Ten-day elevations of the Goose Pond reservoir.
- (8) 1924-1969. Snow depth graphs from November to May 1 of each year.

2. Copies of Past Inspection Reports

Copies of the following reports are included with this report:

- (1) October 17, 1919, by Mr. Robert E. Barrett, General Manager, Connecticut River.
- (2) July 21, 1936, by the New Hampshire Water Resources Board, two pages.
- (3) October 31, 1938, by the New Hampshire Water Control Commission, initialed by AAN & RLT, two pages.
- (4) December 31, 1960, data sheet by the Granite State Electric Co.

3. Drawings

The New Hampshire Water Resources Board has the following prints showing the layout of the dam, sections, and details. Numbers (2) through (7) were made from June 12, 1917, to June 12, 1918, by the Mascoma River Improvement Company, Engineering Department, Turners Falls' office. Numbers (8) through (13) were made in 1952 by the New England Power Service Company, Boston, Massachusetts.

- (1) July, 1915, C-678, Goose Pond Plan (with some contours).
- (2) F-2114 - Details of Earth Embankment at Goose Pond Dam.
- (3) F-2178, F-2179, and F-2180 - Embankment Sections.
- (4) F-2115, F-2116, F-2117, F-2118, and F-2119 - General Layout, Bulkhead, Spillway, and Sluiceway Details.
- (5) B-57, B-58, B-61, and B-62 - Plan of Road, Floodgate, Alternate Spillway, Plans, Profiles, and Sections.
- (6) L-25, L-26, L-27 (L-2121, L-2122, L-2254) - Details of Rack Bars, Reinforcing of Temporary Gate Opening.
- (7) September, 1928, E-2969; and without a date, L-2110 and E-4685 - Profiles at Goose Pond Dam, Clean-out Basins.
- (8) *H-13823, H-13824, H-13825, H-13831, and H-13836 - Spillway Changes.
- (9) H-1037 - Topography of Goose Pond Dam and Vicinity.
- (10) *H-13805 - Repairs to be Made to Dike.
- (11) D-4681, LS-3087 - Rack Details, Steel Nosing Pieces.
- (12) January 17, 1944 - D-3740 - Goose Pond Property and Dam, by the Mascoma River Improvement Co.
- (13) January 31, 1978 - F-2177 - Goose Pond Dam Plan, Profile, and Sections, by the Mascoma River Improvement Co., Engineering Department.

*Reduced copies of drawings are included with this report.

1919

EXCERPT from letter of Robert E. Barrett, General Manager, Connecticut River Conservation Company, Greenfield, Mass., October 17th, 1919. Original letter filed in connection with Grafton Pond file.

GOOSE POND -

On September 24th Goose Pond was visited. This dam is built of earth with a concrete core wall. The exposed portion of the core wall was in first-class condition, there being no evidence of settlement or bulging. No cracks were visible. A good growth of grass was on the downstream embankment and there was no evidence of washing. The heavy riprap on the upstream face of the dam was in good condition except a portion fifty feet long westerly from the spillway where the stone had caved in a foot or more due to the fine gravel upon which it was laid being washed out.

The caretaker was placing additional riprap upon this section and was going to fill up to the original surface of the riprap. An open tile drain was being laid at the toe of the downstream embankment on the westerly side. The downstream slope showed no evidence of sloughing and was in first-class condition.

The water stood at gage 8.7; full pond is gage 23.5. This reservoir was filled to overflowing on April 6th and the gate tender recorded a maximum depth of 16 inches over the spillway in the Spring. There was no floating debris in front of the dam. A large number of floating logs and stumps were removed from in front of the dam during the high water in the Spring by the use of the derrick over the spillway.

*With the repairs to the riprap and the laying of the open tile drain, both of which should be completed by the middle of October, the dam will be in first-class condition,

* October 16th. This work is now practically completed.

NEW HAMPSHIRE WATER RESOURCES BOARD

INVENTORY OF DAMS AND WATER POWER DEVELOPMENTS

DAM

BASIN Cowardin NO. 1 3601 I-5276 15.9NR3
 RIVER Cowardin MILES FROM MOUTH 2.55 D.A. - SQ. MI. 15.9NR3
 TOWN Cowardin OWNER Massachusetts River Improvement Co. Ltd.
 LOCAL NAME OF DAM _____
 BUILT _____ DESCRIPTION East Tye Cement Co. - Concrete & earth foundation
 POND AREA-ACRES 554.05 DRAWDOWN-FT. 119.94 POND CAPACITY-ACRE FT. 12,300,000
 HEIGHT-TOP TO BED OF STREAM-FT. 23.5 MAX. MIN. 20.75
 OVERALL LENGTH OF DAM-FT. 1200 MAX. FLOOD HEIGHT ABOVE CREST-FT. _____
 PERMANENT CREST ELEV. U.S.G.S. 829.4 AS LOCAL GAGE _____
 TAILWATER ELEV. U.S.G.S. For 828.9 AS LOCAL GAGE _____
 SPILLWAY LENGTHS-FT. 45 FREEBOARD-FT. 5
 FLASHBOARDS-TYPE, HEIGHT ABOVE CREST _____
 WASTE GATES-NO. WIDTH MAX. OPENING DEPTH SILL BELOW CREST _____

REMARKS Condition good subject to periodic inspection
Mouth Cowardin R. 16.65 mi from North Massena R.
36 Cowardin R. into Massena R.

lat 45° 45' N
 long 72° 00' W

POWER DEVELOPMENT

UNITS	NO.	RATED HP.	HEAD FEET	C.F.S. FULL GATE	KW.	MAKE

USE Power generation Storage only

REMARKS A.C. Benjes, Supt Granite State Elec Co., Lebanon gave following figures 500 acres pond area, 536,000 cu ft. storage capacity 19.6 ft draw down. 9/9/37

DATE 7/21/36

PUBLIC SERVICE COMMISSION OF NEW HAMPSHIRE—DAM RECORD I-5276

TOWN CANAAH	TOWN NO. 1	STATE NO. 36 01
RIVER STREAM Goose Pond		
DRAINAGE AREA 15 Sq. Mi.	POND AREA	
DAM TYPE Earth Dyke Cement Core.	FOUNDATION NATURE OF	
MATERIALS OF CONSTRUCTION Concrete, Earth		
PURPOSE OF DAM POWER—CONSERVATION—DOMESTIC—RECREATION—TRANSPORTATION—PUBLIC UTILITY		
HEIGHTS, TOP OF DAM TO BED OF STREAM 23.5'	TOP OF DAM TO SPILLWAY CRESTS 5'	
SPILLWAYS, LENGTHS DEPTHS BELOW TOP OF DAM 45'	LENGTH OF DAM 1200' Approx.	
FLASHBOARDS TYPE, HEIGHT ABOVE CREST		
OPERATING HEAD CREST TO N. T. W.	TOP OF FLASHBOARDS TO N. T. W.	
WHEELS, NUMBER KINDS & H. P.		
GENERATORS, NUMBER KINDS & K. W.		
H. P. 90 P. C. TIME 100 P. C. EFF.	H. P. 75 P. C. TIME 100 P. C. EFF.	
REFERENCES, CASES, PLANS, INSPECTIONS See Plans		

REMARKS

OWNER: Mascoma River Improvement Co.
(N. E. Power)

CONDITION: Good

MENACE: Yes. Will be subject to periodic inspection.

To the Public Service Commission:

The foregoing memorandum on the above dam is submitted covering inspection made July 21, 1936, according to notification to owner dated June 25, 1936, and bill for same is enclosed.

D. Waldo White
Chief Engineer

August 6, 1936
Copy to Owner

NEW HAMPSHIRE WATER CONTROL COMMISSION
DATA ON DAMS IN NEW HAMPSHIRE

LOCATION

STATE NO. 36.01

Town Grafton: County Grafton

Stream Goose Pond

Basin-Primary Conn R.: Secondary Mascoma R.

Local Name

Coordinates—Lat. 43° 40' + 7.133: Long. 72° 5' + 2.000

GENERAL DATA

Drainage area: Controlled 72.0 Sq. Mi.: Uncontrolled 16.6-E Sq. Mi.: Total 88.6 Sq. Mi.

Overall length of dam 1200 ft.: Date of Construction 1912-1918

Height: Stream bed to highest elev. 23.5 ft.: Max. Structure 13.5 ft.

Cost—Dam: Reservoir

DESCRIPTION

E Dyke- Cement Core

Waste Gates

Type

Number: Size ft. high x ft. wide

Elevation Invert: Total Area sq. ft.

Hoist

Waste Gates Conduit

Number: Materials

Size ft.: Length ft.: Area sq. ft.

Embankment

Type

Height—Max. ft.: Min. ft.

Top—Width: Elev. ft.

Slopes—Upstream on: Downstream on

Length—Right of Spillway: Left of Spillway

Spillway

Materials of Construction Cement

Length—Total ft.: Net 45 ft.

Height of permanent section—max. 13.5 ft.: Min. ft.

Flashboards—Type: Height ft.

Elevation—Permanent Crest: Top of Flashboard

Flood Capacity 1670 cfs.: 105 cfs/sq. mi.

Abutments

Materials:

Freeboard: Max. 5.0 ft.: Min. ft.

Headworks to Power Devel.—(See "Data on Power Development")

OWNER Mascoma River Improvement Co. Lebanon N H

REMARKS GRANITE STATE ELECTRIC (NEES)
Use- Conservation
B-7

**NEW HAMPSHIRE WATER CONTROL COMMISSION
DATA ON RESERVOIRS & PONDS IN NEW HAMPSHIRE**

LOCATION

AT DAM NO. 36.01

Town Canaan: County Grafton

Stream Goose Pond

Basin—Primary Conn R.: Secondary Mascoma R.

Local Name

DRAINAGE AREA

Controlled Sq. Mi.: Uncontrolled Sq. Mi.: Total Sq. Mi.

ELEVATION vs. WATER SURFACE AREA vs. VOLUME

Point	Head Feet	Surface Area Acres	Volume Acre Ft.
(1) Max. Flood Height	.....	.....	.....
(2) Top of Flashboards	.....	.....	.....
(3) Permanent Crest	.....	.....	.....
(4) Normal Drawdown	..... 21.5 .....	..... 555 .....	..... 12,300
(5) Max. Drawdown	.....	.....	.....
(6) Original Pond	..... U S G S 825 .....	.....	.....

Base Used: Coef. to change to U.S.G.S. Base

RESERVOIR CAPACITY

	Total Volume	Useable Volume
Drawdown	.....ft.	.....ft.
Volume	.....ac. ft.	.....ac. ft.
Acre ft. per sq. mi.	.....	.....
Inches per sq. mi.	.....	.....

USE OF WATER Conservation

OWNER ~~Mascoma River Improvement Co.~~ Lebanon N H

REMARKS GRANITE STATE ELECTRIC (NEES)

B-8

Tabulation By A A N & R L T Date October 31, 1938.

RATING COMPANY Granite State Electric Company

LOCATION & DRAINAGE AREA
TOWN Canaan & Hanover (b) POST OFFICE Lebanon, N.H.
COUNTY Grafton (d) STATE New Hampshire
RIVER Goose Pond Brook - Mascoma River (f) MILES ABOVE MOUTH (DAM) 8.6 (above Mascoma Dam)
GROSS DRAINAGE AREA 15.7 SQ. MI. (h) NET DRAINAGE AREA 15.7 SQ. MI.

HYDRAULIC DATA

ELEVATIONS
TOP OF DAM 27.5 (A) (b) TOP OF BOARDS 21.5 (c) NORMAL FULL 21.5 (d) CREST (SEE ITEM (11e)) 36.5 ^{10' @ 19.5}
MINIMUM NORMAL 0 (f) MINIMUM USABLE 0 (g) MINIMUM POSSIBLE 0

NOTE: ELEVATIONS ARE ON Gage DATUM; ZERO = 85.0 above
Local Datum

DRAINAGE

FULL POND AREA 668 ACRES
MAX. NORMAL DRAWDOWN 21.5 FT.; VOLUME 11688 ACRE-FEET; .509 BCF 13.96 INS. ON 15.7 SQ. MI. (1)
MAX. USABLE DRAWDOWN 21.5 FT.; VOLUME 11688 ACRE-FEET
MAX. POSSIBLE DRAWDOWN 21.5 FT.; VOLUME 11688 ACRE-FEET

(1) EQUIVALENT TO 650,600 KWH ON THE FOLLOWING PLANTS: No. 4
EQUIVALENT TO 3.80 BILLION GALLONS

STORAGE RESERVOIRS ABOVE

N) LOCATION	GROSS DRAINAGE AREA	SQ. MI.	USABLE VOLUME	ACRE-FEET
<u>None</u>				
O) LOCATION	GROSS DRAINAGE AREA	SQ. MI.	USABLE VOLUME	ACRE-FEET
P) LOCATION	GROSS DRAINAGE AREA	SQ. MI.	USABLE VOLUME	ACRE-FEET
Q) LOCATION	GROSS DRAINAGE AREA	SQ. MI.	USABLE VOLUME	ACRE-FEET

DAM

A) MATERIAL Earth & Concrete (b) TYPE Rolled Fill (c) OVERALL LENGTH 1,240 FT. (d) MAX. HT. 41 (A) FT.
E) SPILLWAY (46'-5" @ El. 21.5 effective length) Pin Type 36'-5" Crest @ El. 16.5
Pin Type 10'-0" Crest @ El. 19.5
Stanchion Type 10'-0" Crest @ El. 3.5 (See IV below)
F) FLASHBOARDS Pin Type - 36'-5" Boards 5'-0" High
Pin Type - 10'-0" Boards 2'-0" High
Stanchion Type - 10'-0" Wide x 15' (approx.) High (See IV below)
G) GATES 2 - 4' x 4' Gates Sill @ El. - 2.0 (83.0)

WATERWAYS & MISC. Submerged stop logs 10' x 15' approx. Sill @ GH 3.5

B-9

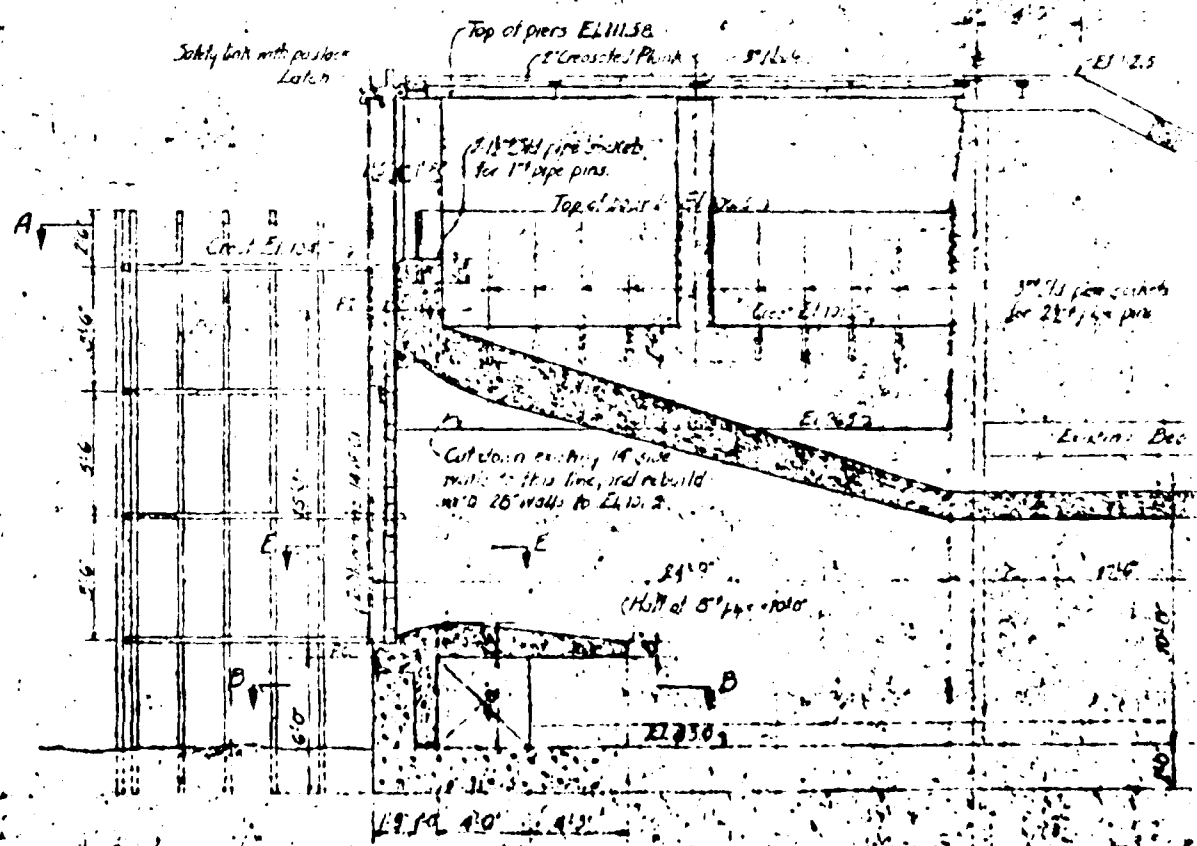
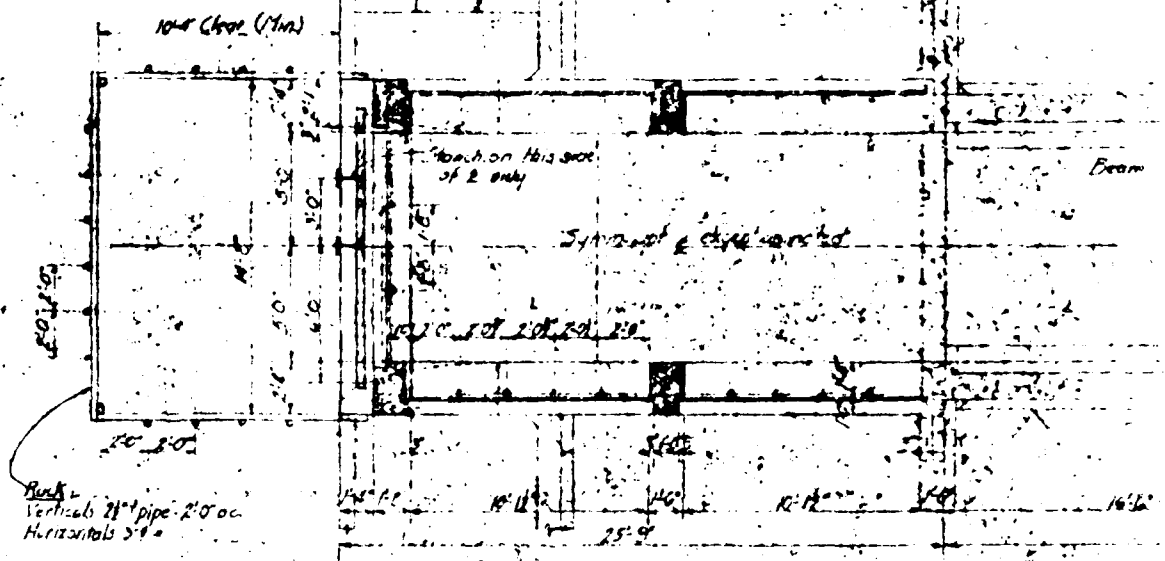
NOTES

(A) = APPROXIMATE ONLY
(NA) = NOT AVAILABLE

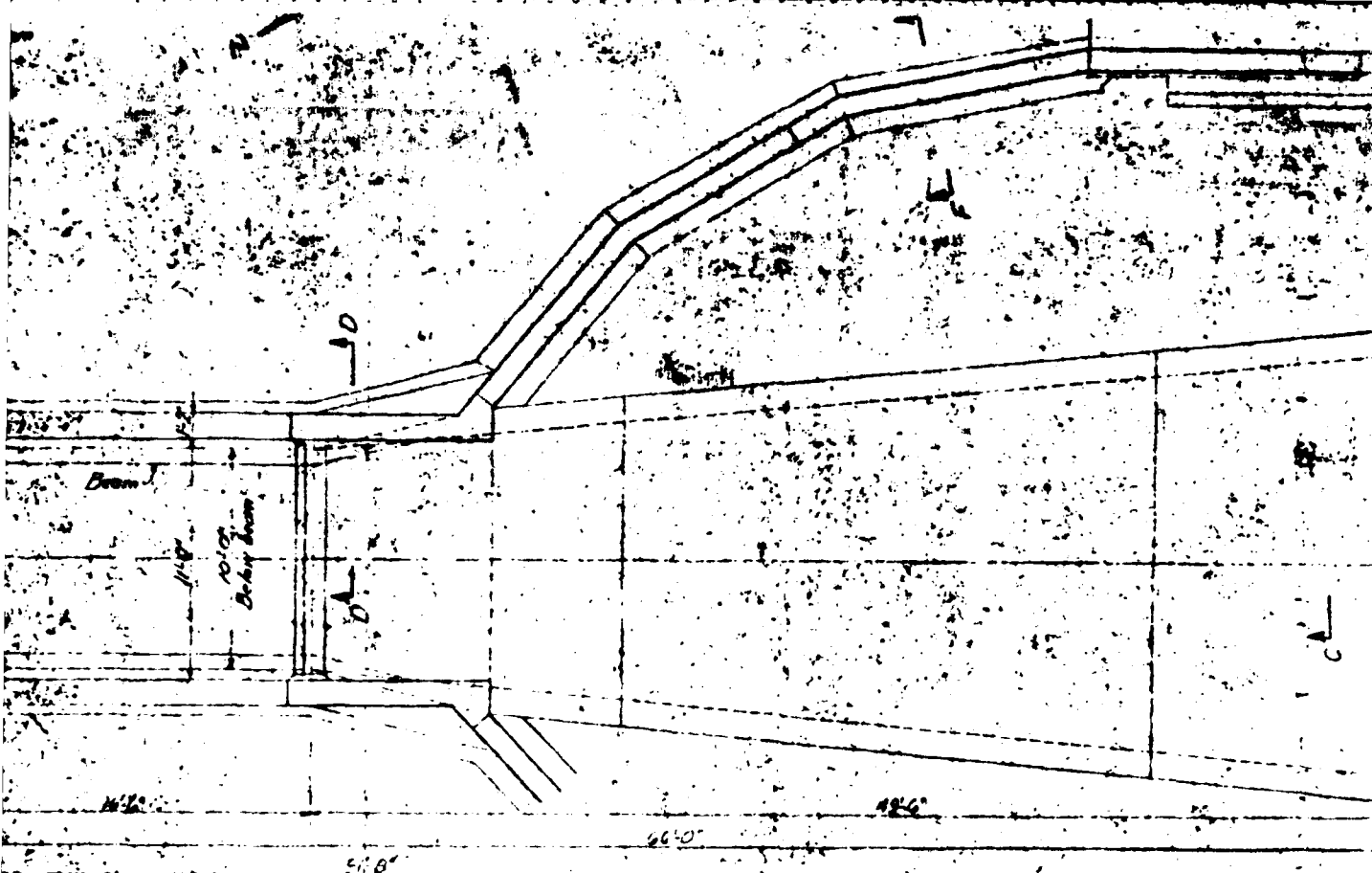
DATA AS OF 12/31/60

HYD. ECON. NO. 366A

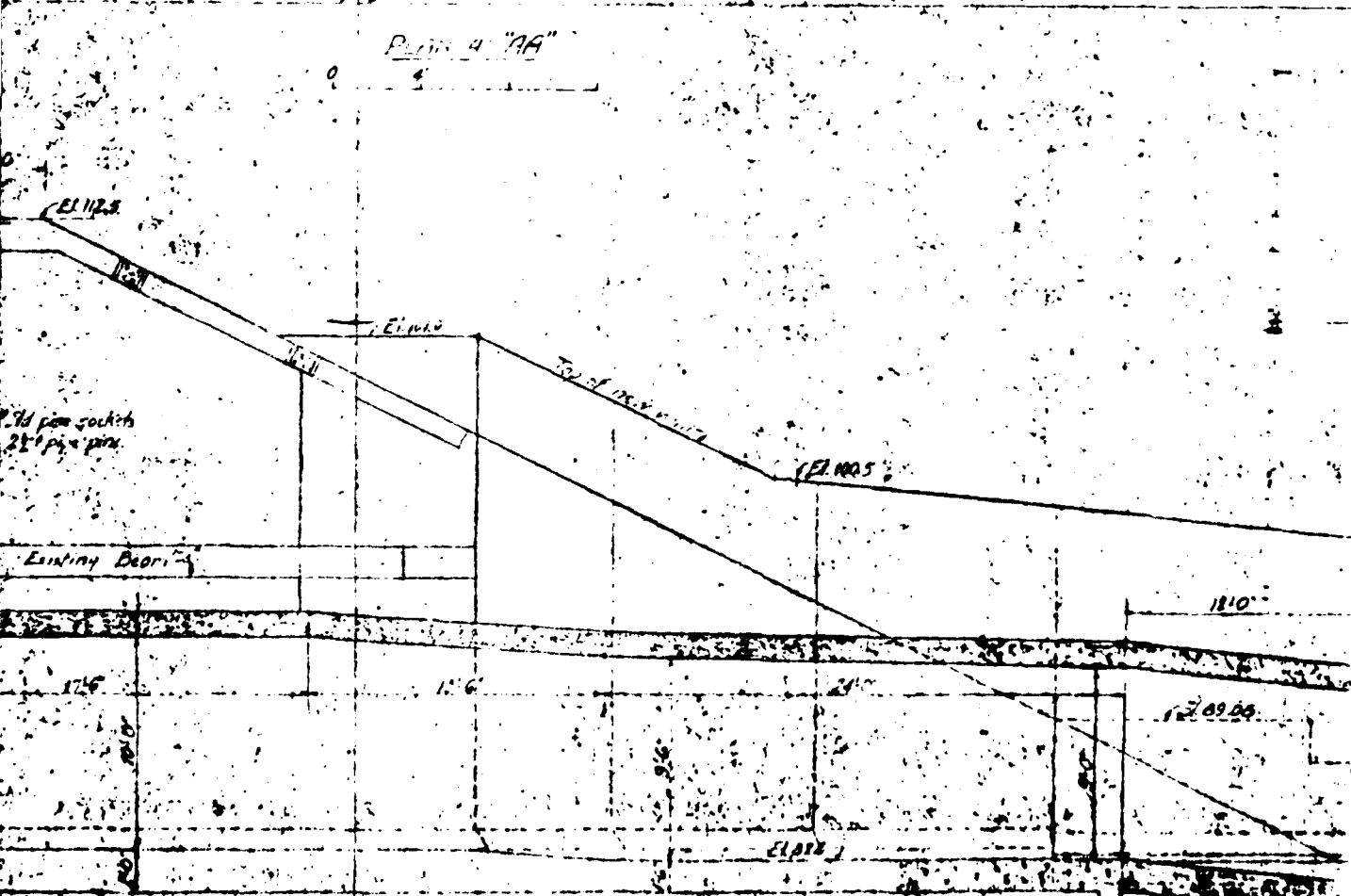
012451



REPRODUCED AT GOVERNMENT EXPENSE

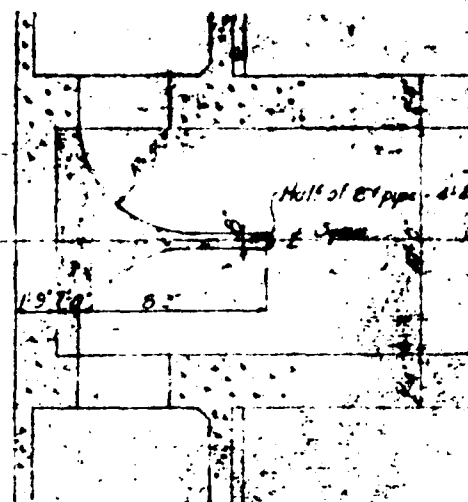


Plan A "AA"



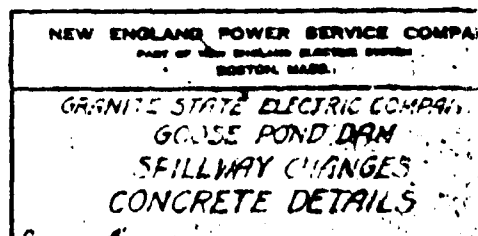
SECTION ON F

REPRODUCED BY MOVEMENT EXPENSE



GENERAL NOTES
 CONTINUED FROM VED 22. See also
 Field Notes, 20 Sept, 1950, line 1, 1950.

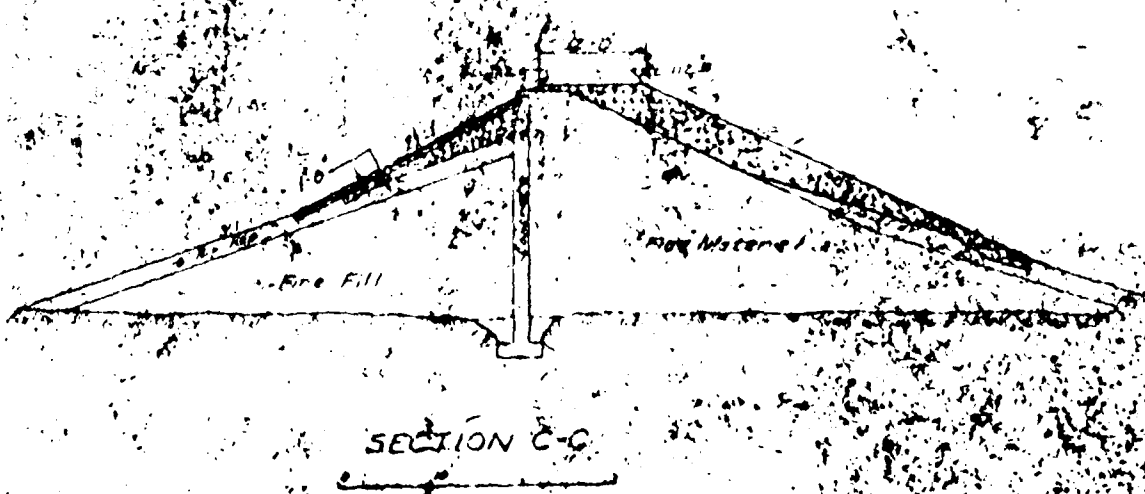
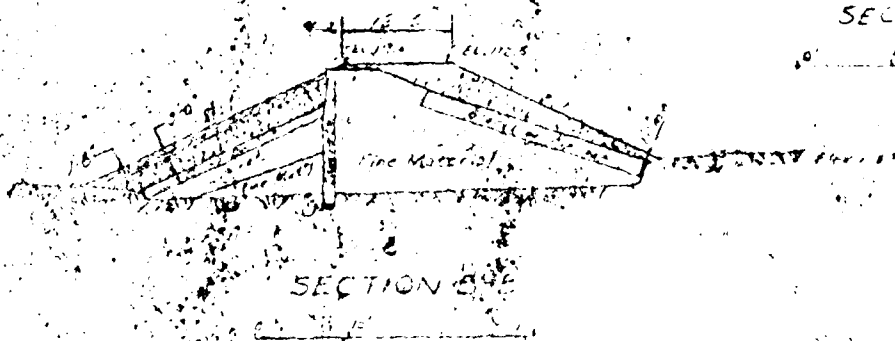
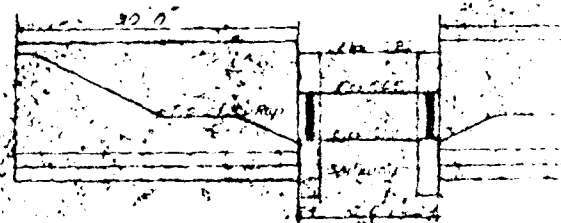
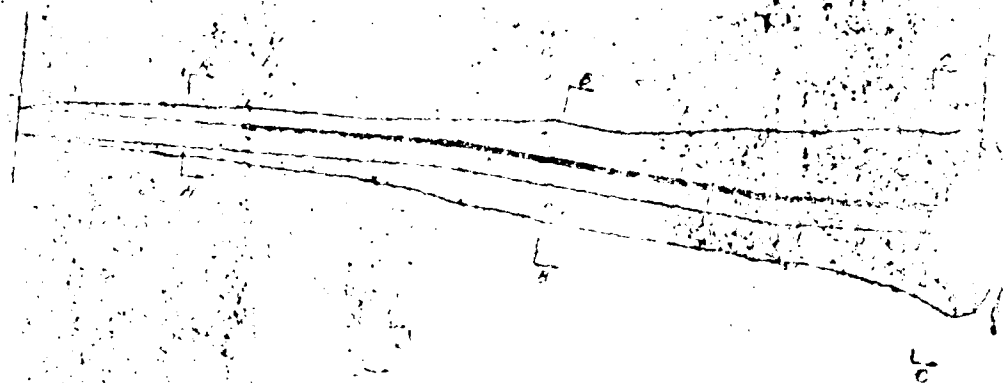
Reinforcing	H-130
Sections and Details	H-130
See Location see	H-130



REPRODUCED AT GOVERNMENT EXPENSE

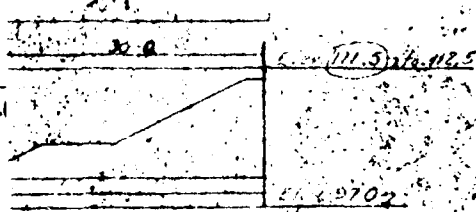
on Aug 12

4. 1929

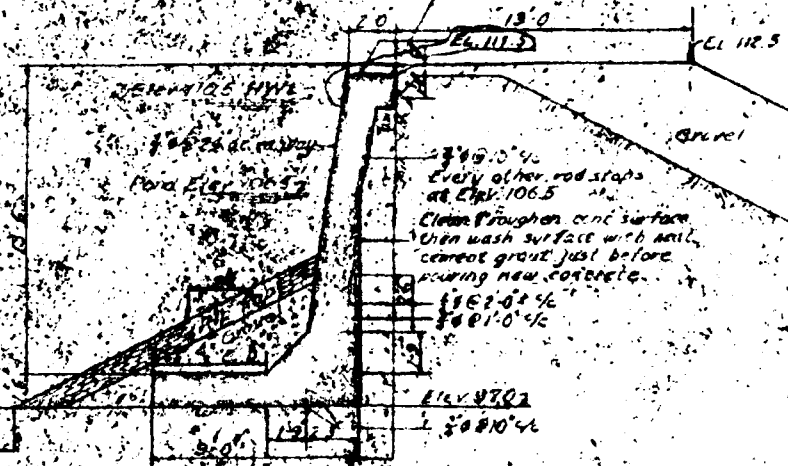




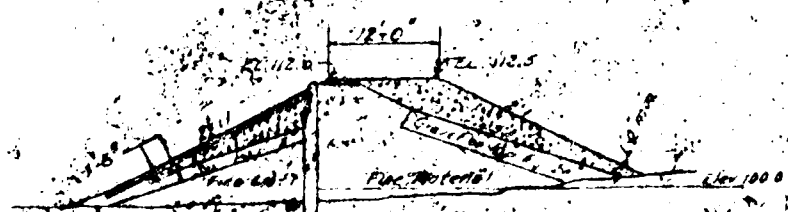
PLAN OF DAMSITE



Remove existing dirt to Elev 170 As required. Replace with well compacted material to the new slope lines indicated hereon.



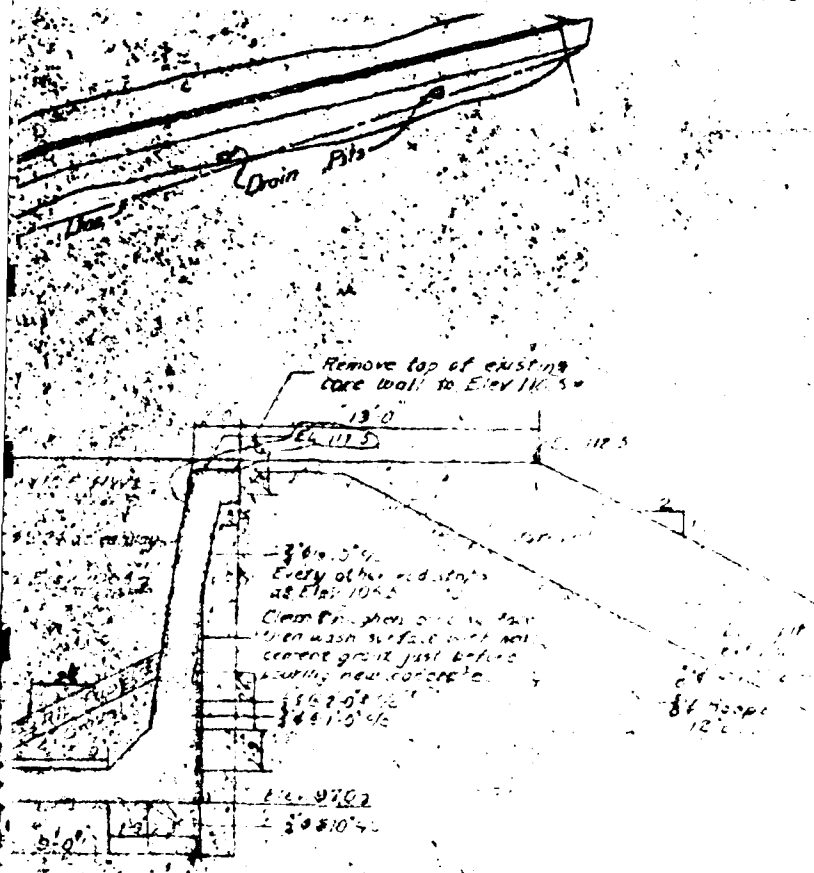
SECTION D-D



SECTION E-E



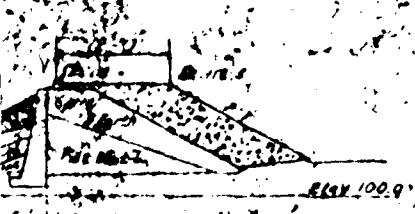
SECTION F-F



SECTION D-D



SECTION E-E



SECTION F-F

LEGEND

- Fill Wall
- Gravel

NOTES

- Concrete to conform to N.E.P.S. Co. Spec. for ready mixed concrete Rev. 6-1-50
- Reinforcing to be a minimum of 2' from face of concrete
- All reinforcing to have a minimum of 4' from face of concrete
- Reinforcing to be alternate grade of steel
- New fill shall be placed & compacted according to N.E.P.S. Co. specifications
- Channel on all exposed horizontal & vertical edges including construction joints

REFERENCE DRAWINGS

- Spillway, Abut. Conc. Details
- Plan, Profile & Sections
- Topography
- Alternate Spillway Design

NEW ENGLAND POWER SERVICE COMPANY
PART OF NEW ENGLAND ELECTRIC SYSTEM
BOSTON, MASS.

GRANITE STATE ELECTRIC COMPANY
GOOSE POND DAM
1952 REPAIRS TO DAM

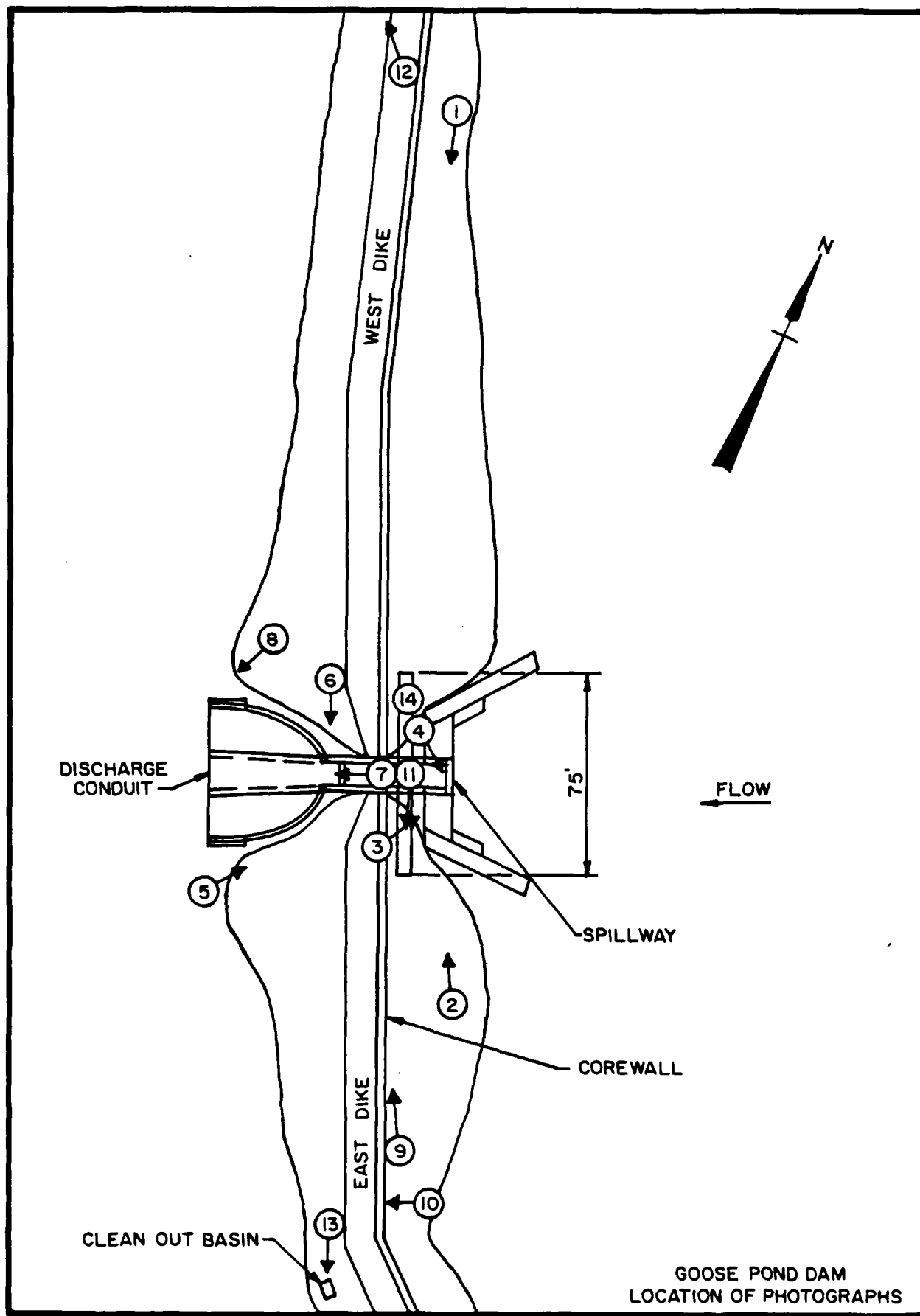
APPENDIX C
PHOTOGRAPHS

APPENDIX C

REPRESENTATIVE PHOTOGRAPHS OF PROJECT

<u>LOCATION PLAN</u>		<u>Page</u>
Plan 1 - Location of Photographs Taken on June 8, 1978		C-3
<u>PHOTOGRAPHS</u>		
<u>No.</u>	<u>Negative No.</u>	<u>Page</u>
1. Goose Pond Dam, looking east. Showing vegetation on the upstream side of the core wall.	8-10A	C-4
2. Intake structure with rectangular spillway.	8-6A	C-4
3. Spillway crest with flashboards in place, looking northwest.	8-8A	C-5
4. Stop log stanchions on the north side of the intake structure	8-22A	C-5
5. Buttressed wingwall of discharge channel, looking northwest.	8-18A	C-6
6. Discharge channel with cross beams, looking east.	8-16A	C-6
7. Discharge channel showing top of sluice conduit, looking downstream.	8-15A	C-7
8. Both wingwalls of discharge channel and Goose Pond Brook, looking downstream.	8-13A	C-7
9. Erosion of concrete core wall of the east dike.	8-3A	C-8
10. Cracking and spalling of concrete core wall, east dike.	8-4A	C-8

<u>No.</u>		<u>Negative No.</u>	<u>Page</u>
11.	East dike, showing riprap and concrete core wall near the intake structure.	8-23A	C-9
12.	West dike, showing trees on the downstream slope (left), and bushes on the upstream slope near the west end of the dike.	8-11A	C-9
13.	Clean-out basin near the downstream toe of the east dike.	8-25A	C-10
14.	Gate hoist at the northeast corner of the intake structure, with the crank locked.	8-21A	C-10

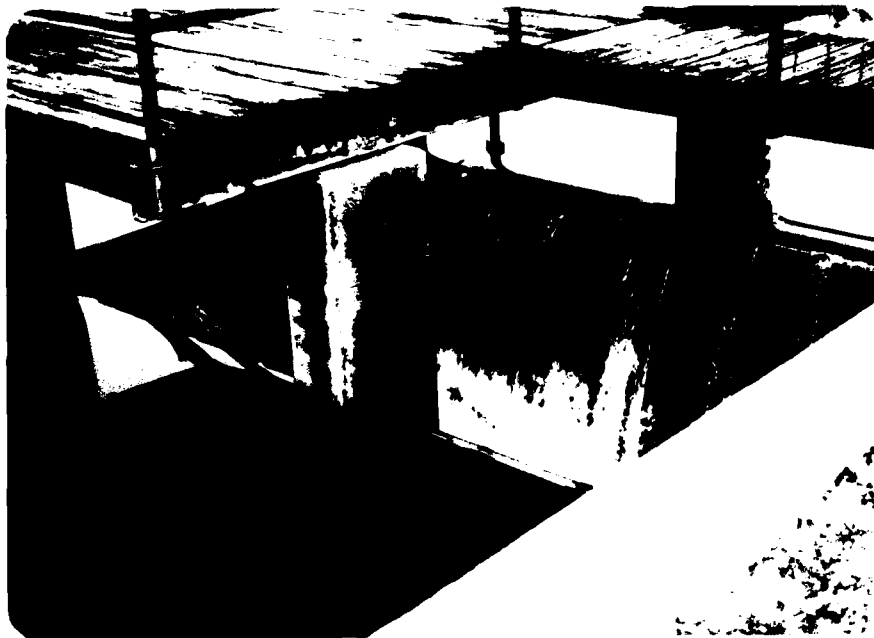




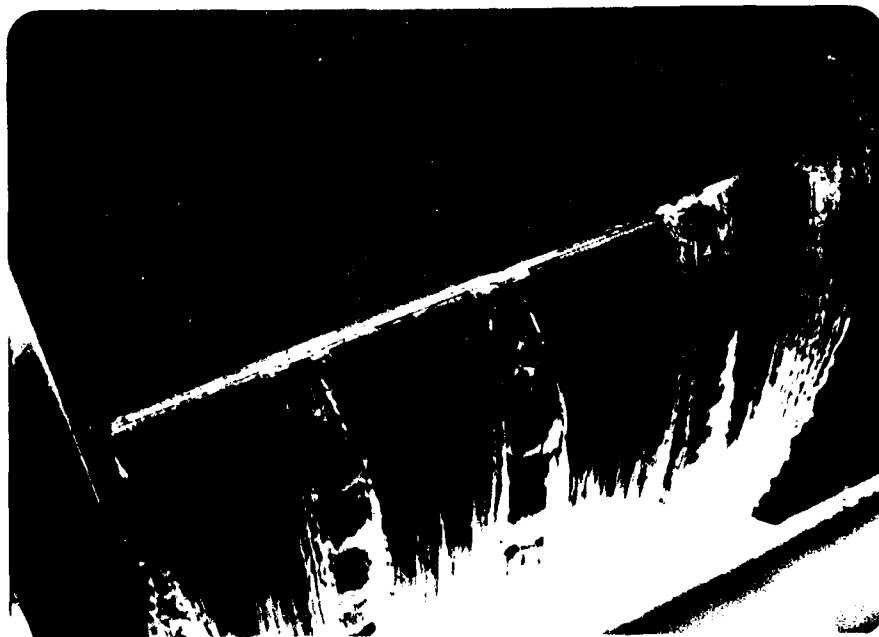
1. Goose Pond Dam, Looking East. Showing Vegetation on the Upstream Side of Core Wall.



2. Intake Structure with Rectangular Spillway.



3. Spillway Crest with Flashboards in Place, Looking Northwest.



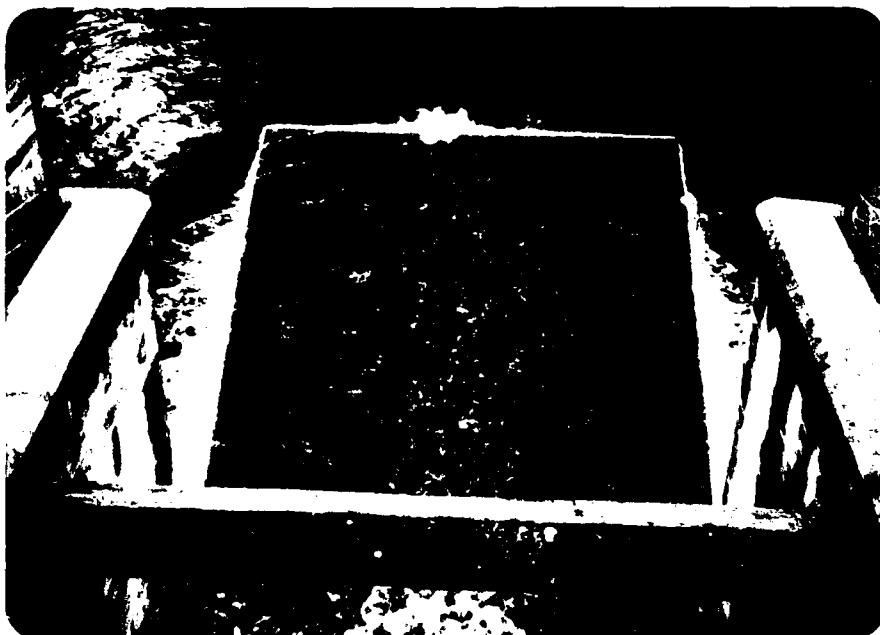
4. Stop Log Stanchions on the North Side of the Intake Structure.



5. Buttressed Wingwall of Discharge Channel, Looking Northwest.



6. Discharge Channel with Cross Beams, Looking East.

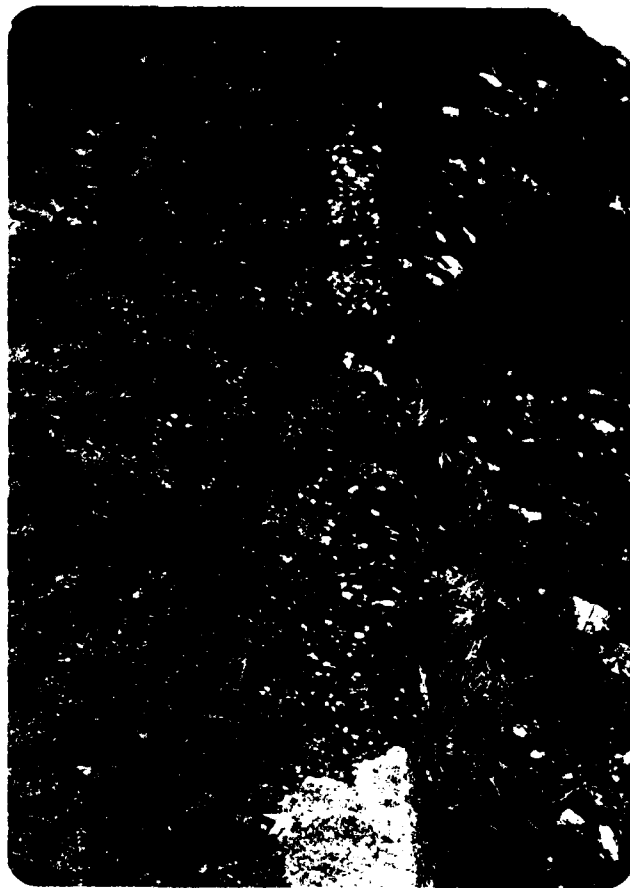


7. Discharge Channel Showing Top of Sluice Conduit, Looking Downstream.



8. Left Abutment of Discharge Channel and Goose Pond Brook, Looking Downstream.

9. Erosion of Concrete
Core Wall of the
East Dike.



10. Cracking and Spalling of Concrete Core Wall, East Dike.



11. East Dike, Showing Rip-Rap and Concrete Core Wall Near the Intake Structure.



12. West Dike, Showing Trees on the Downstream Slope (Left), and Bushes on the Upstream Slope Near the West End of Dike.



13. Clean-out Basin Near the Downstream Toe of the East Dike.



14. Gate Point at the Northeast Corner of Intake Structure, with the Crank Locked.

APPENDIX D
HYDROLOGIC & HYDRAULIC COMPUTATIONS

SUBJECT NATIONAL DAM INSP. PROGRAM
GOOSE POND DAM

Surface area of Goose Pond Dam = 15.7 square miles
The drainage area of Goose Pond is characterized
by mountainous topography. Hence, from guide
curves furnished by Corps of Engineers, it
is found that

$$\text{Probable maximum inflow flood peak} = 1830 \times 15.7 \\ = 28,730 \text{ cfs}$$

According to the size classification, Goose Pond
Dam is large.

According to hazard classification, it falls
into the category of high hazard dam.

$$1. \text{Spillway Test Flood (inflow)} = 28,730 \text{ cfs}$$

APPENDIX-D

FAY, SPOFFORD & THORNDIKE, INC.
ENGINEERS
BOSTON

PROJECT EN-006 (4)

FILE NUMBER EN-006

SHEET NUMBER 2

DATE 8-29-73

COMPUTED BY PLM

CHECKED BY _____

SUBJECT GOOSE Pond

TEST FLOOD TYPICAL HYDROGRAPH

Length of Travel = 35,700'

Difference in Elevation = 1385'

T_c = Time of Concentration

$$T_c = \frac{(35700)^{1.15}}{7700 \times (1385)^{0.38}}$$

$$= \frac{172015.3}{7700 \times 15.6}$$

$$= 1.43 \quad \text{say } 1.5 \text{ hr.}$$

spillway test inflow flood peak = 28,730 cfs.

SUBJECT GOOSE POND

TEST FLOOD T₁₀-ON HYDROGRAPH (BASED ON SCS
DIMENSIONLESS UNIT HYDROGRAPH)

$$T_c = 1.5 \text{ hr.}$$

$$Q_p = 28,730 \text{ CFS}$$

<u>T(hrs.)</u>	<u>T/T_c</u>	<u>Q/Q_p</u>	<u>Q(CFS)</u>
.375	0.25	0.05	1,436.5
.75	0.50	0.13	5,171.4
1.125	0.75	0.73	20,972.9
1.50	1.00	1.00	28,730.0
1.875	1.25	0.90	22,984.0
2.25	1.50	0.40	11,492.0
2.625	1.75	0.25	7,182.5
3.00	2.00	0.17	4,834.1

REFER TO PAGE 15 FOR THE PLOT

SUBJECT WITNESS FOR THE RATE OF FLOW
BOTH SLOPES

REFER TO TABLE ON PAGE 7

ELEVATION

Q₁

83.0

0

85.0

64.0

87.0

168.0

89.0

248.0

91.0

326.0

93.0

384.0

95.0

440.0

97.0

496.0

99.0

552.0

101.0

600.0

101.5

608.0

102.5

616.0

104.0

634.0

105.0

640.0

106.0

696.0

107.0

720.0

108.0

744.0

109.0

768.0

110.0

792.0

111.0

812.0

112.0

840.0

ELEVATION

Q₂

101.0 0.0

101.5 0.0

102.0 63.0

103.0 210.0

104.0 403.0

105.0 638.0

106.0 899.0

107.0 1193.0

108.0 1520.0

109.0 1886.0

110.0 2268.0

111.0 2688.0

112.0 3108.0

REFER TO TABLE ON PAGE 8

SUBJECT BATING FOR END SPILLWAY
10 FT. LONG

ELEVATION

Q₃

101.0

0

101.5

0

102.0

4.0

103.0

11.0

104.0

18.0

105.0

25.0

106.0

32.0

107.0

39.0

108.0

46.0

109.0

54.0

110.0

61.0

111.0

67.0

112.0

75.0

REFER TO TABLE ON PAGE 8.

RATING TABLE FROM RECORDS

GRANITE STATE ELECTRIC CO.
GOOSE POND IMPROVED FLOOD WASTEWAY

Discharge in C.F.S. of both gates for each foot of combined vertical opening
E.G. Pond at 98.3; one gate 3' open, one gate 2' open or total- 5'; Discharge
= $5 \times 66 = 330$ C.E.S.

	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
83	0	0	0	1	1	1	1	1	2	2
84	2	2	4	4	4	5	6	6	6	7
85	8	8	9	9	10	11	11	12	12	12
86	13	13	15	16	16	17	18	18	19	20
87	21	21	22	23	23	23	24	24	25	26
88	26	27	27	28	28	29	29	30	30	31
89	31	32	32	33	33	33	34	34	35	35
90	36	36	36	37	37	38	38	38	39	39
91	40	40	40	41	41	41	42	42	43	43
92	44	44	45	45	45	46	46	47	47	47
93	48	48	49	49	49	50	50	50	51	51
94	52	52	52	53	53	53	54	54	54	55
95	55	55	56	56	57	57	57	58	58	58
96	59	59	59	60	60	60	61	61	61	62
97	62	62	63	63	63	63	64	64	64	65
98	65	65	66	66	67	67	68	68	68	69
99	69	69	69	70	70	70	70	71	71	71
100	72	72	72	73	73	73	74	74	74	74
101	75	75	75	75	76	76	76	76	77	77
102	77	78	78	78	78	78	79	79	79	80
103	80	80	80	81	81	81	81	82	82	82
104	83	83	83	83	83	84	84	84	84	85
105	85	85	85	86	86	86	86	86	87	87
106	87	88	88	88	88	88	89	89	89	90
107	90	90	90	91	91	91	91	92	92	92
108	93	93	94	94	94	94	94	95	95	95
109	96	96	96	96	97	97	97	98	98	98
110	99	99	99	99	100	100	100	101	101	101
111	102	102	102	103	103	104	104	104	104	105
112	105									

RATING TABLE FROM RECORDS

8

GRANITE STATE ELECTRIC CO.

Goose Pond Dam Discharge Rating, C.F.S. per horizontal foot

Side Spillways, over Clear Concrete Crest at 101.5, 36.4' long.

This assumes boards removed to crest; 1st. from side spillways, then from end.

Elev.	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
101						.0	.1	.4	.7	1.1
2	1.5	1.8	2.1	2.4	2.7	3.1	3.4	3.8	4.2	4.6
3	5.0	5.4	5.8	6.2	6.7	7.2	7.6	8.1	8.6	9.1
4	9.6	10.1	10.6	11.1	11.7	12.3	12.8	13.4	14.0	14.6
105	15.2	15.8	16.4	17.0	17.6	18.3	18.9	19.5	20.1	20.7
6	21.4	22.0	22.7	23.4	24.1	24.8	25.5	26.2	26.9	27.6
7	28.4	29.1	29.8	30.6	31.4	32.2	33.0	33.8	34.6	35.4
8	36.2	37.0	37.8	38.7	39.6	40.5	41.3	42.2	43.1	44.0
9	44.9	45.8	46.7	47.6	48.5	49.4	50.3	51.2	52.1	53.0
110	54.0	55.0	56.0	57.0	58.0	59.0	60.0	61.0	62.0	63.0
11	64.0	65.0	66.0	67.0	68.0	69.0	70.0	71.0	72.0	73.0
12	74.0									

End Spillway, over Concrete crest at 101.5 10.0 ft. long.

This assumes boards removed to crest; 1st from side spillways, then from end.

Elev.	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
101						.0	.0	.1	.2	.3
2	.4	.4	.5	.5	.6	.7	.7	.8	.9	1.0
3	1.1	1.1	1.2	1.3	1.3	1.4	1.4	1.5	1.6	1.7
4	1.8	1.8	1.9	1.9	2.0	2.1	2.1	2.2	2.3	2.4
105	2.5	2.5	2.6	2.7	2.8	2.9	2.9	3.0	3.0	3.1
6	3.2	3.2	3.3	3.4	3.5	3.6	3.6	3.7	3.7	3.8
7	3.9	3.9	4.0	4.1	4.2	4.3	4.3	4.4	4.4	4.5
8	4.6	4.6	4.7	4.8	4.9	5.0	5.0	5.1	5.2	5.3
9	5.4	5.4	5.5	5.5	5.6	5.7	5.7	5.8	5.9	6.0
110	6.1	6.1	6.2	6.2	6.3	6.4	6.4	6.5	6.5	6.6
11	6.7	6.8	6.9	7.0	7.1	7.2	7.2	7.3	7.3	7.4
12	7.5									

All Spillways, over top of boards, 46.4 ft. long.

Head on boards	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
0	.0	.1	.3	.5	.8	1.2	1.6	2.0	2.4	2.9
1	3.4	3.9	4.4	4.9	5.5	6.0	6.6	7.2	7.8	8.4
2	9.0	9.7	10.3	11.0	11.7	12.3	13.1	13.8	14.5	15.3
3	16.0									

Note: These values reflect effect of backwater of Discharge Waterway.
Also interference of side and end spillways.

D-8

N.E.P.S.Co. 9-1-1953 G.N.B.

$$A = 10 \times 15 = 150.0 \text{ sq. ft.}$$

$$Q = C_d \cdot A \cdot \sqrt{2gY} = 0.45 \times 150 \times \sqrt{2 \times 32.2 \times Y}$$

$$= 540 \times \sqrt{Y}$$

ELEVATION

Y

Q₄

89.0

91.0

93.0

95.0

97.0

99.0

101.0

101.5

103.0

103.5

104.0

105.0

106.0

107.0

108.0

109.0

110.0

111.0

112.0

13.0

14.5

15.0

15.5

16.5

17.5

18.5

19.5

20.5

21.5

22.5

23.5

1687.0

1988.0

2091.0

2126.0

2193.0

2259.0

2323.0

2385.0

2445.0

2504.0

2561.0

2618.0

SUBJECT COMPOSITE RATING CURVE

GOOSE TOWN DAM

ELEVATION

$Q = Q_1 + Q_2 + Q_3 + Q_4$

83.0	0.
85.0	64.0
87.0	168.0
89.0	248.0
91.0	320.0
93.0	384.0
95.0	440.0
97.0	496.0
99.0	552.0
101.0	600.0
101.5	2,295.0
103.0	2,849.0
104.0	3,211.0
105.0	3,696.0
106.0	3,886.0
107.0	4,275.0
108.0	4,695.0
109.0	5,153.0
110.0	5,625.0
111.0	5,928.0
112.0	6,641.0

GRANITE STATE ELECTRIC COMPANY
GOOSE FOND STORAGE DATA

D.A. 15.7 Sq. Mi.

10 Feet at 19.5
Crest G. H. 36'-5" at 16.5
Minimum Drawdown G.H. 0.0

G.H. Feet	Area Acres	Acre Feet	c.f.s. Days	Inches on 15.7 Sq. Mi.	M.C.F.	Thous.KWH K = 4.6
0	376	0	0	0	0	0
1	400	388	195	.464	16.9	21.6
2	424	800	403	.955	34.8	44.5
3	445	1234	622	1.474	53.8	68.7
4	464	1689	852	2.017	73.6	94.0
5	480	2161	1090	2.581	94.1	120.3
6	495	2648	1355	3.163	115.3	147.4
7	508	3150	1588	3.762	137.2	175.3
8	521	3665	1848	4.376	159.6	204.0
9	532	4191	2114	5.006	182.6	233.3
10	543	4730	2385	5.648	206.0	263.3
11	554	5279	2662	6.304	229.9	293.8
12	565	5838	2943	6.973	254.3	324.9
13	575	6408	3231	7.653	279.1	356.7
14	585	6988	3524	8.346	304.4	389.0
15	596	7579	3821	9.052	330.2	421.8
16	607	8181	4125	9.771	356.4	455.1
17	618	8794	4434	10.503	383.1	489.5
18	629	9418	4748	11.248	410.3	524.2
19	640	10053	5069	12.007	437.9	559.5
20	652	10599	5395	12.778	466.1	595.5
21	663	11356	5726	13.563	494.6	632.1
21.5	668	11688	5893	13.959	509.1	650.6

C.F.S. DAYS

G.H.	0	.1	.2	.3	.4	.5	.6	.7	.8	.9
0	0	19	38	57	76	95	115	135	155	175
1	195	215	235	255	275	296	317	339	360	382
2	403	424	446	467	489	510	532	555	578	600
3	622	645	668	690	712	735	758	782	805	829
4	852	875	899	922	946	969	993	1017	1042	1066
5	1090	1114	1138	1163	1187	1211	1236	1261	1286	1311
6	1335	1360	1385	1410	1435	1460	1486	1511	1537	1562
7	1588	1614	1639	1665	1690	1716	1742	1769	1795	1821
8	1848	1874	1900	1926	1953	1979	2006	2033	2060	2087
9	2114	2140	2167	2194	2221	2248	2275	2303	2330	2358
10	2385	2412	2440	2467	2495	2522	2550	2578	2606	2634
11	2662	2689	2717	2745	2773	2801	2829	2858	2887	2915
12	2943	2972	3000	3028	3057	3086	3115	3144	3173	3202
13	3231	3260	3289	3318	3347	3376	3406	3435	3465	3494
14	3524	3553	3583	3612	3642	3671	3701	3731	3761	3791
15	3821	3852	3882	3912	3942	3972	4003	4033	4064	4094
16	4125	4156	4186	4217	4247	4278	4309	4340	4372	4403
17	4434	4465	4496	4528	4559	4590	4622	4653	4685	4717
18	4748	4780	4812	4844	4875	4907	4939	4972	5004	5037
19	5069	5101	5134	5166	5199	5231	5264	5297	5329	5362
20	5395	5428	5461	5493	5526	5559	5592	5626	5659	5693
21	5726	5759	5793	5826	5860	5893				

N.E.P.S.Co. L.D. Pierce 3-28-61

SUBJECT GOOSE POND DAM

STORAGE ABOVE ELEV 101.5

ELEVATION	TOTAL STORAGE (ACRE-FEET)	STORAGE ABOVE ELEV. 101.5 ACRE-FEET	STORAGE ABOVE ELEV 101.5 FT ³
101.5	8487	0	
102.0	8794	307	13.34×10^6
103.0	9418	931	40.55×10^6
104.0	10053	1566	68.21×10^6
105.0	10699	2212	96.35×10^6
106.0	11356	2869	124.97×10^6
106.5	11688	3201	139.44×10^6

REFER TO TABLE ON PAGE 11

SUBJECT

COLE FORD 12/17

PROJECT NUMBER

DATE

COMPUTED BY

CHECKED BY

STEP 27 STEP FLOOD RAINFALL CALCULATIONS

STEP	TIME INTERVAL, HRS	INFLOW I_1 (BEGINNING OF INTERVAL) CFS	INFLOW I_2 (END OF INTERVAL) CFS	INFLOW STORAGE $I_1 I_2$ FT ³	OUTFLOW O_1 (BEGINNING OF INTERVAL) CFS	OUTFLOW O_2 (END OF INTERVAL) CFS	OUTFLOW STORAGE $O_1 O_2$ FT ³	STORAGE IN THE RESERVOIR, INJUNCTION, FT ³	TOTAL STORAGE AT THE END OF INTERVAL, FT ³	RESERVOIR LEVEL, ASSUMED, FT	ELEVATION ACTUAL, FT
1	2	3	4	5	6	7	8	9	10	11	12
1	20-0.2	0	750	0.27×10^6	2000	1750	1.35×10^6	-1.08×10^6	-1.08×10^6	101.4	101.4
2	0.2-0.4	750	1,500	0.81×10^6	1750	1750	1.26×10^6	-0.45×10^6	-1.53×10^6	101.4	101.4
3	0.4-0.6	1500	2,000	1.62×10^6	1750	1750	1.26×10^6	-0.36×10^6	-1.17×10^6	101.4	101.4
4	0.6-0.8	2000	6,000	3.24×10^6	1750	2000	1.35×10^6	1.86×10^6	7.02×10^6	101.5	101.5
5	0.8-1.0	6000	15,250	7.65×10^6	2000	2350	1.57×10^6	6.58×10^6	6.80×10^6	101.7	101.8
6	1.0-1.2	15,250	22,250	12.86×10^6	2350	2550	1.70×10^6	12.10×10^6	18.90×10^6	102.3	102.3
7	1.2-1.4	22,250	27,750	18.36×10^6	2550	2750	1.91×10^6	16.45×10^6	35.35×10^6	102.9	102.9
8	1.4-1.6	27,750	28,250	20.16×10^6	2750	2950	2.05×10^6	18.11×10^6	53.46×10^6	103.5	103.5
9	1.6-1.8	28,250	24,750	19.12×10^6	2950	3200	2.21×10^6	12.91×10^6	70.37×10^6	104.1	104.1
10	1.8-2.0	24,750	17,500	15.92×10^6	3200	3350	2.36×10^6	13.57×10^6	83.94×10^6	104.6	104.6
11	2.0-2.2	19,500	13,000	11.70×10^6	3350	2500	2.47×10^6	9.23×10^6	93.17×10^6	104.9	104.9
12	2.2-2.4	13,000	9,150	8.01×10^6	3500	3550	2.54×10^6	5.47×10^6	98.64×10^6	105.1	105.1
13	2.4-2.6	9,150	7,250	5.94×10^6	3550	3600	2.57×10^6	3.37×10^6	102.01×10^6	105.2	105.2
14	2.6-2.8	7,250	6,000	4.71×10^6	3600	3650	2.61×10^6	2.16×10^6	104.12×10^6	105.3	105.3
15	2.8-3.0	6,000	5,000	3.96×10^6	3650	3650	2.63×10^6	1.37×10^6	105.50×10^6	105.3	105.3
16	3.0-3.2	5,000	0	3.24×10^6	3650	3650	2.63×10^6	0.61×10^6	106.11×10^6	105.3	105.3
17	3.2-3.4	0	3,250	2.41×10^6	3650	3650	2.63×10^6	0.02×10^6	106.09×10^6	105.3	105.3
18	3.4-3.6	3,250	2,750	2.16×10^6	3650	3650	2.63×10^6	0.17×10^6	106.42×10^6	105.3	105.3
19	3.6-3.8	2,750	2,250	1.8×10^6	3650	3650	2.63×10^6	-0.83×10^6	104.59×10^6	105.2	105.2
20	3.8-4.0	2,250	1,750	1.44×10^6	3650	3650	2.63×10^6	-1.19×10^6	103.4×10^6	105.2	105.2

SUBJECT GOOSE POND DAM

ESTIMATION OF DEPTH OF FLOOD WAVE
IN THE VICINITY OF DAMAGE IMPACT AREA
DUE TO BREACH IN THE DAM AT RESERVOIR
FULL CONDITION.

As explained in Section 1.2d, it is not possible to generate downstream dam failure hydrograph in the vicinity of the damage impact area using USGS Quadrangle Sheet on which the contours are at 20-foot intervals.

Besides, no other topographic map was available for the area.

From the knowledge of the damage impact area and the course of the stream, a ball park estimate has been made as follows:

Depth of water above the riverbed at F.R.L

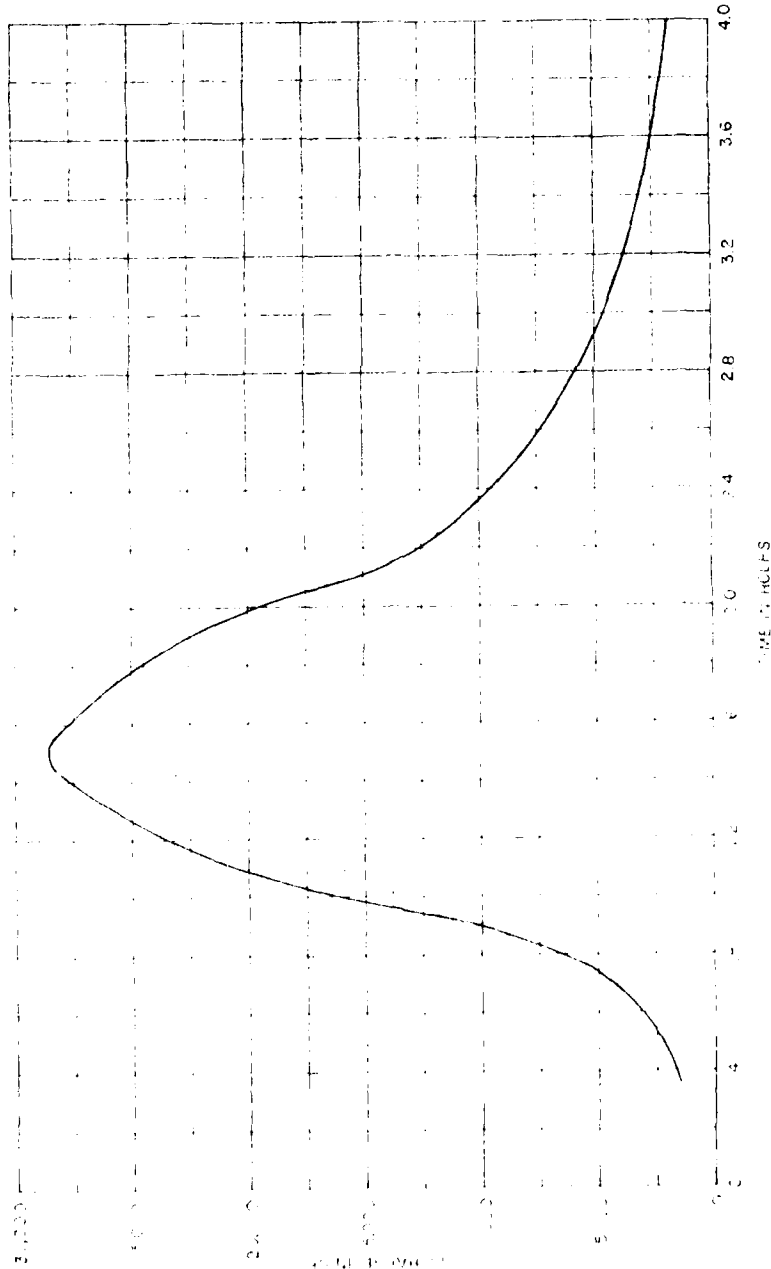
$$= 106.5 - 81.5$$

$$= 25.0$$

Height of flood wave at damage impact

area is estimated to be 15 feet.

Width of water spread at damage impact area is approximately indicated on the USGS Map included in the APPENDIX-D.



TIME IN HOURS

SPILLWAY TEST FLOOD INFLOW HYDROGRAPH

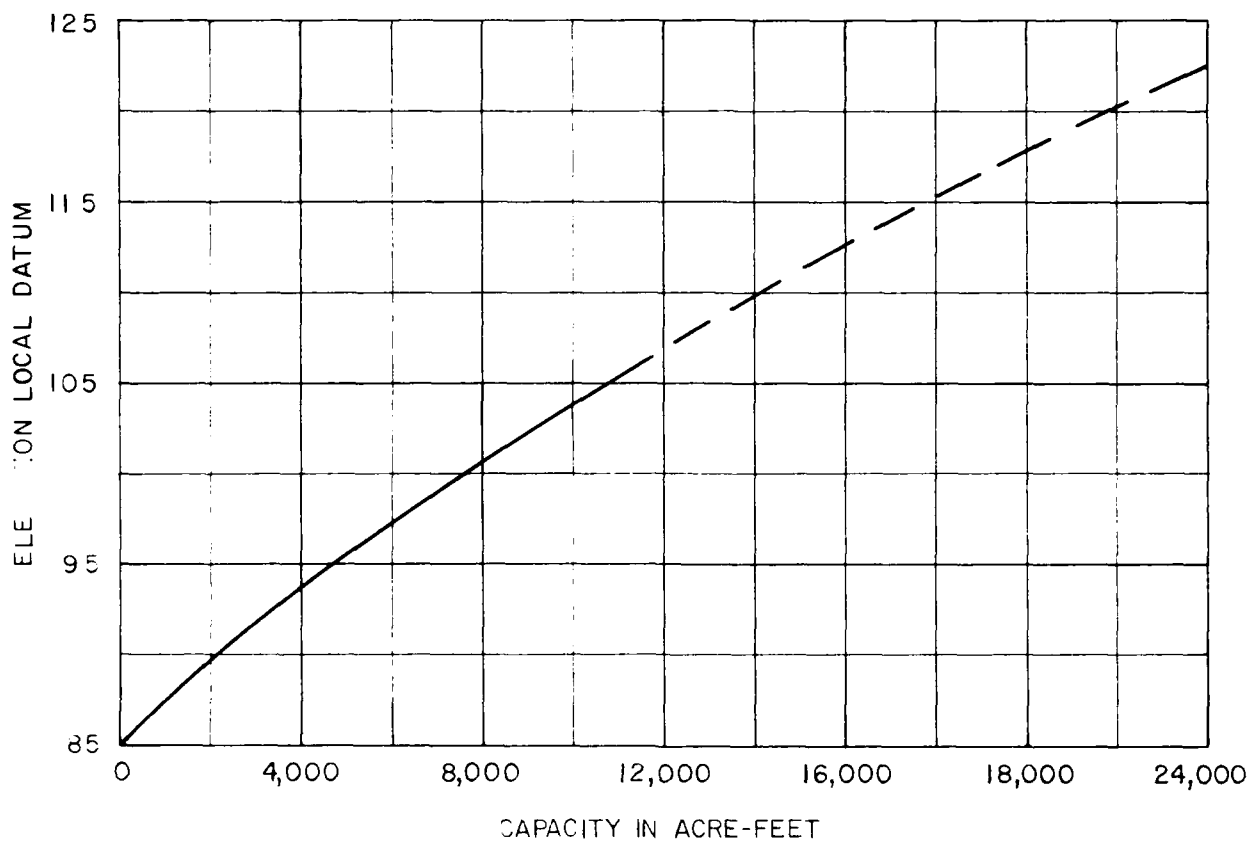
FAY, SPOFFORD & THORNDIKE, INC.
ENGINEERS
BOSTON, MASS.

U.S. ARMY ENGINEER DIV. NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

GOOSE POND DAM

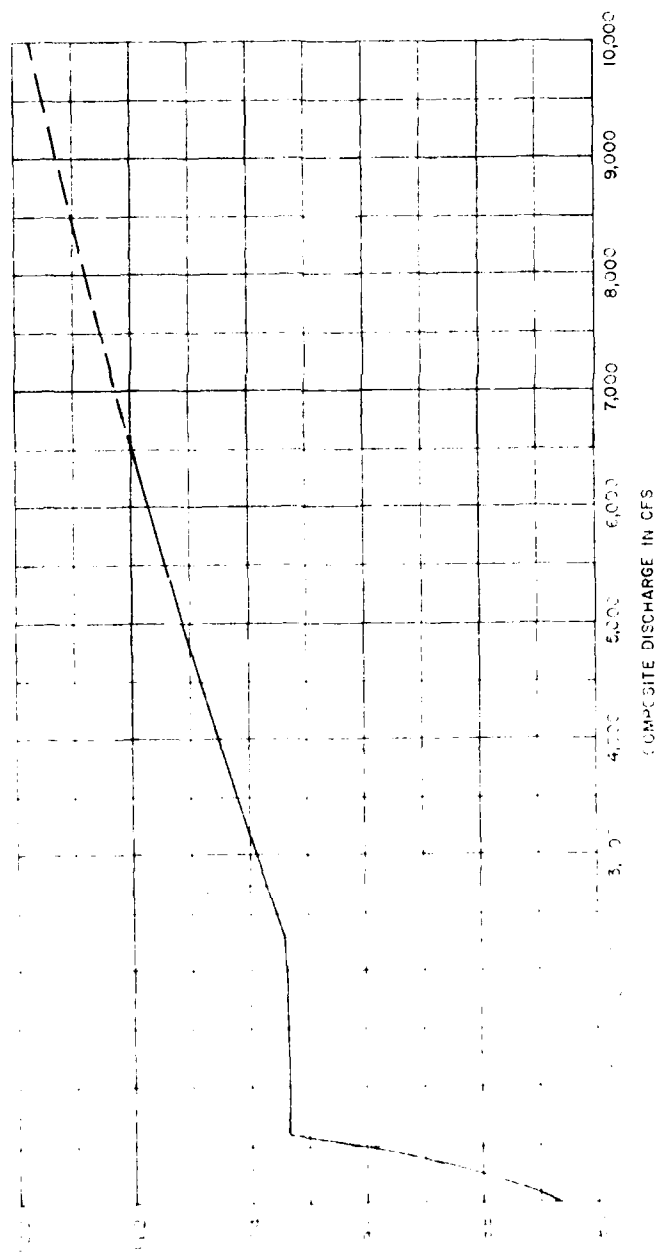
GOOSE POND, BROOK NEW HAMPSHIRE



STORAGE CAPACITY - ELEVATION CURVE

106.5 (LOCAL DATUM) = 825 USGS (ESTIMATED)

FAY, SPOFFORD & THORNDIKE, INC. ENGINEERS BOSTON, MASS.		U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.	
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS			
GOOSE POND DAM			
GOOSE POND BROOK		NEW HAMPSHIRE	
		SCALE	AS SHOWN
		DATE	AUGUST, 1978



RATING CURVE (COMPOSITE) FOR SPILLWAY AND DAM

FAY, SPOFFORD & THORNDIKE, INC.
ENGINEERS
BOSTON, MASS.

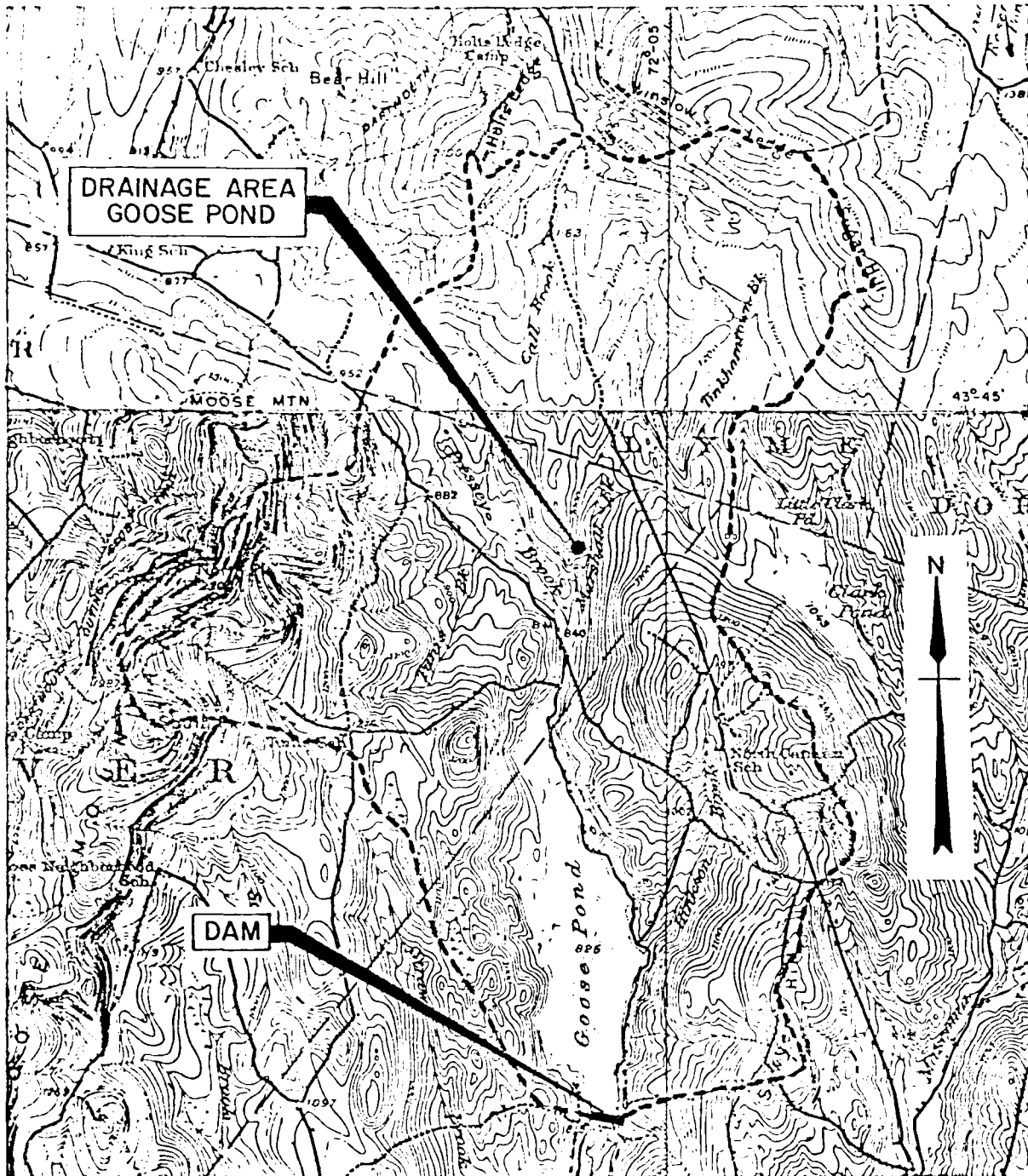
U.S. ARMY ENGINEER DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

GOOSE POND DAM

DATE: 10-1-60

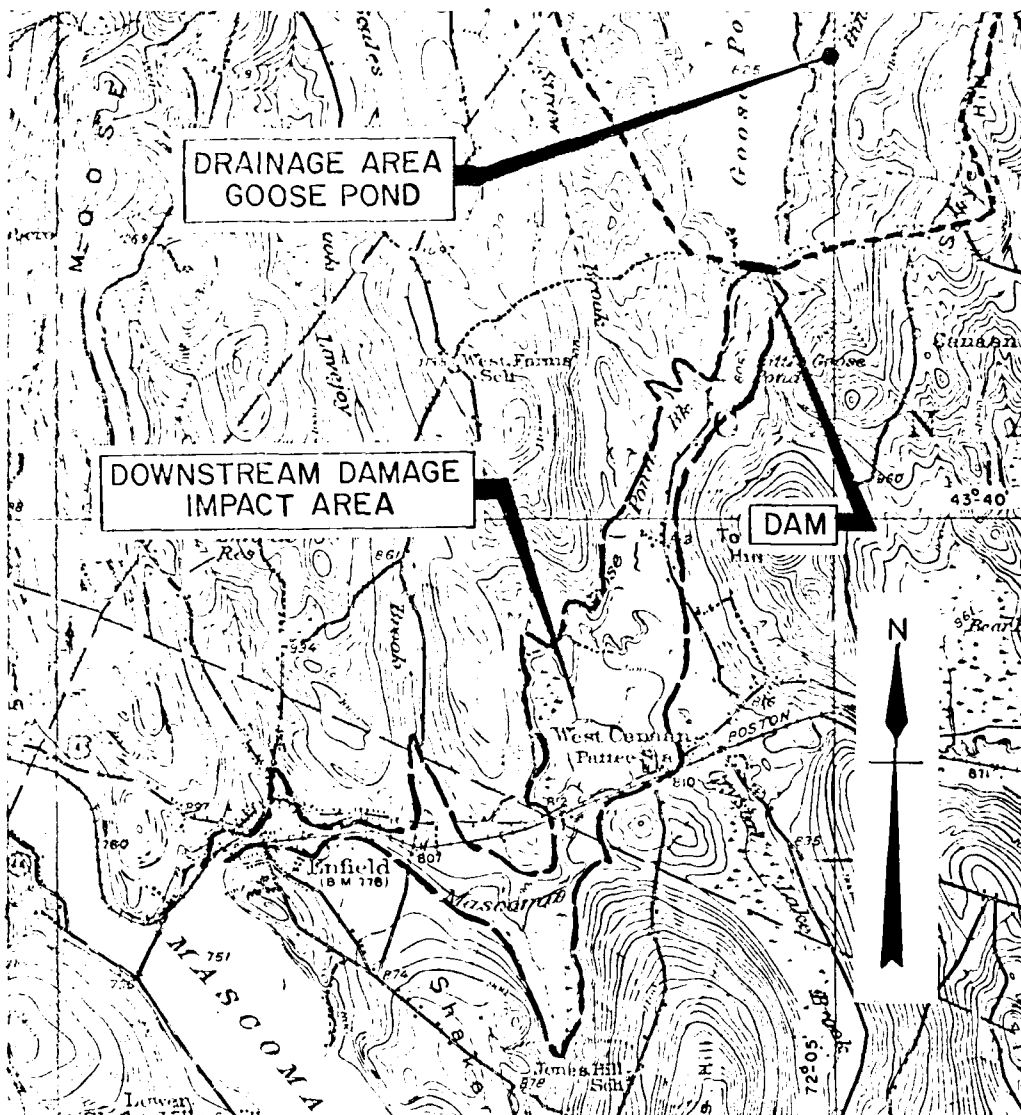
BY: H. H. HARRIS



SCALE : 1:62500 (ACTUAL)

UNITED STATES
DEPARTMENT OF INTERIOR
GEOLOGICAL SURVEY

NEW HAMPSHIRE-VERMONT
MASCOMA QUADRANGLE 1927
MT. CUBE QUADRANGLE 1931



SCALE 1:62500 (ACTUAL)

UNITED STATES
DEPARTMENT OF INTERIOR
GEOLOGICAL SURVEY

NEW HAMPSHIRE - VERMONT
MASCOMA QUADRANGLE 1927

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

QUANTITY NUMBER	STATE	COUNTY	DATE	OWNER	NAME	REPORT DATE DAY | MO | YR
11	NEV	CLATSOP	02	GOOSE POND DAM	GOOSE POND DAM	00 SEP 78

POPULAR NAME	NAME OF IMPROVEMENT
GOOSE POND BROOK	GOOSE POND
RIVER OR STREAM	NEAREST DOWNSTREAM CITY - TOWN - VILLAGE
POPULATION	500

TYPE OF DAM	YEAR COMPLETED	PURPOSES	DESIGN CAPACITY (CUBIC FEET)	IMPROVING CAPACITIES (CUBIC FEET)	OWNER	OWN	FED	R	PRV	FED	SCS	A	VEN	DATE
RECIPRO	1918	RS	31	20	15000	11700	NEO	N	N	N	N	N	N	13 SEP 78

REMARKS									
SPILLWAY	MAXIMUM DISCHARGE (CFS)	VOLUME OF DAM (CUBIC FEET)	POWER CAPACITY (KW)	INSTALLED (KW)	NAVIGATION LOCKS				
1	1200	20050	3600	50	15000				

OWNER	ENGINEERING BY	CONSTRUCTION BY
STATE OF NEW HAMPSHIRE	HASCOMA RIVER IMPR CO	HP CUNNING'S CONSTRUCTION CO

DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
WATER RES RD	WATER RES RD	WATER RES RD	WATER RES RD

INSPECTION BY	INSPECTION DATE DAY | MO | YR	AUTHORITY FOR INSPECTION
PAY SPOTFORD + THORNDIKE, INC.	08 JUN 78	PL 92-367

REMARKS	
---------	--

END

FILMED

8-85

DTIC